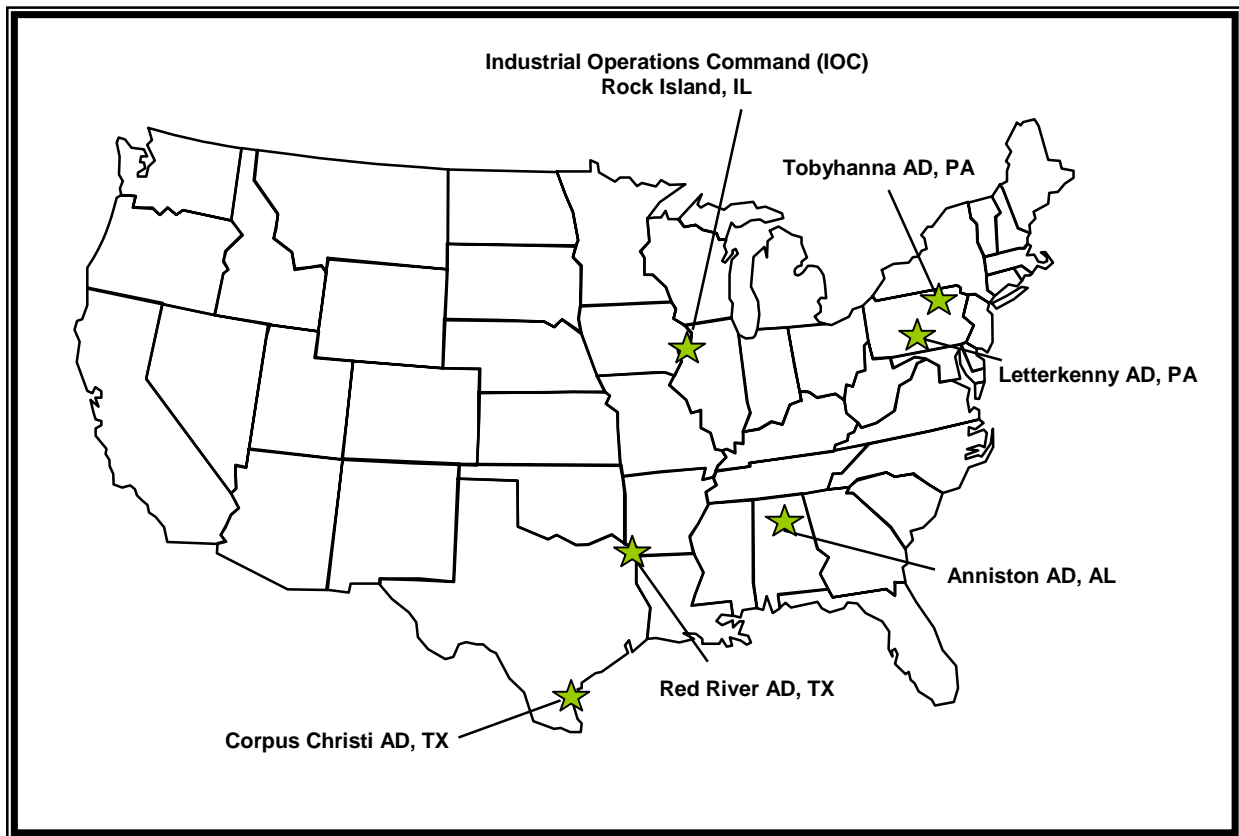


## Army Maintenance Depots



### 1.0 ARMY

The Army's major command for depot maintenance is the US Army Materiel Command (AMC), located in Alexandria, Virginia. Management of specific commodities and maintenance depots is performed by major subordinate commands (MSC), under Headquarters AMC. The MSCs are US Army Aviation and Missile Command (AMCOM), Communications-Electronics Command (CECOM), Industrial Operations Command (IOC), and Tank-automotive and Armament Command (TACOM). Each MSC translates its depot maintenance requirements and financial resources into organic, interservice, or contractual depot maintenance programs. The MSCs then execute the maintenance programs in the depots or arsenals. Currently, AMC is in the process of transferring the five depots' maintenance missions from the IOC to the other MCSs in a two-year process. Tobyhanna Army Depot (TYAD) is now under the command and control of CECOM. Anniston Army Depot (ANAD) and Red River Army Depot (RRAD) are under the operational control of

TACOM, with command and control passing to TACOM 1 Oct 1999. Corpus Christi (CCAD) and Letterkenny (LEAD) Army Depots are under the operational control of AMCOM, with command and control passing to AMCOM 1 Oct 1999. The three Ammunition Centers, tenants on ANAD, LEAD, and RRAD remain a part of IOC.

## 1.1 Anniston Army Depot (ANAD), Anniston, Alabama

### 1.1.1 OVERVIEW

#### History:

- Located in Anniston (Bynum area) Alabama.
- In March 1940, the War Department began planning construction of the Anniston Ordnance Depot (AOD) in northeast Alabama.
- Construction began on the first 500 ammunition storage igloos in February 1941.
- In 1952 the depot was assigned a maintenance mission for the overhaul and repair of combat vehicles.
- During the '50s the depot's missions were expanded to include the repair, overhaul and modification of anti-aircraft and mobile artillery.
- Upgrade and repair of combat vehicles continued into the '60s and included the M19, M47, M48, M56 and M59 vehicles.
- On 1 August 1962, the installation name was changed to Anniston Army Depot (ANAD).
- In 1963 the maintenance and storage of chemical munitions began.
- Beginning in the early '70s overhaul of the M551 Sheridan tank started.
- In 1975, overhaul and conversion of the M48A1 to the M48A5 model began.
- In 1979 the M60A1 to M60A3 conversion program commenced.
- As the '80s began, missile maintenance became an added mission as well as the M1 Abrams tank.
- In August 1992, the General Supply Mission was assumed by the Defense Distribution Depot, Anniston (DDAA), who became a major tenant organization on the depot.
- Beginning in 1993, *Partnering with Industry* efforts was undertaken, with the depot becoming the forerunner in this new arena. Workload partnerships involve the M1 family of vehicles (FOV) as well as the M58, M113, M577 and M1064 FOVs.
- In August 1994, the Center of Military History (CMH) clearinghouse was established as a tenant organization at ANAD.
- In April 1995, the Anniston Chemical Activity (ANCA) was established and became another ANAD tenant.
- In August 1998, the 722<sup>nd</sup> Ordnance Company (EOD) relocated from Fort McClellan, Alabama to Anniston Army Depot under Base Realignment and Closure (BRAC) auspices.
- On 1 October 1998, operational control of Anniston Army Depot was transferred from the Industrial Operations Command (IOC) to the Tank-automotive and Armaments Command (TACOM).
- Also on 1 October 1998, the conventional ammunition mission became a tenant organization function of the newly established Anniston Munitions Center (ANMC) (previously the Directorate of Ammunition).

**Mission:**

Anniston Army Depot's integrated industrial platform of 2002 will provide support and sustainment of land based weapon systems, associated parts, components, and munitions to keep U.S. and allied forces ready, around the world.

In addition we will provide support to defense supply systems for low volume, hard-to-do manufacturing; material and chemical laboratory services to Major Subordinate Commands (MSCs) and their installations; and engineering/concurrent engineering support to program managers in the form of systems development, research and development, project prototyping, and technology insertion.

**Location:**

- The depot is located in northeast Alabama approximately 10 miles west of the city of Anniston and Fort McClellan.
- The small community of Bynum lies on the depot's southern boundary, while Pelham Range (a wooded operational training area owned by Fort McClellan) is the northern boundary. The east and west boundaries are bordered by lightly populated rural lands.
- Just a short distance to the south is Interstate 20, a major east-west artery that provides easy access to two of the south's largest cities – Birmingham, Alabama (50 miles west) and Atlanta, Georgia (90 miles east)

**Size:**

- 15,279 acres (25 square miles) to include 40 acres of lakes and streams.
- 2,054 buildings.
- 1,279 ammunition storage igloos.
- 8.8M total square footage.
- \$225M current value of facilities.
- \$1,241M replacement value of facilities.
- \$ 190M current value of equipment.
- 244 miles of streets and roads.
- 46 miles of railroad tracks.
- 87 miles of fencing.

**Workforce/Payroll:**

• ANAD civilian workforce (12/31/98)	2,583
• ANAD military (12/31/98)	4
• Tenant civilian workforce (12/31/98)	523
• Tenant military (12/31/98)	44
• Contractors, civilian	936

**Total workforce including military** **4,090**

• FY99 (estimated) ANAD civilian payroll	\$132,873,808
• FY99 (estimated) ANAD military payroll	\$ 281,724

**Transportation Access:**

- Major east-west interstate highway system – I-20.
- Thirty to fifty regular route common carrier (motor freight) roads.
- Two small commercial airports within an eight mile radius.
- Fifty miles from a major Alabama airport (Birmingham) and 90 miles from Atlanta's Hartsfield International Airport.
- Immediate access to main rail lines and is in close proximity to major rail switching yards at Birmingham, Huntsville and Montgomery, Alabama as well as Atlanta, Georgia.

**Environmental Programs:**

- The Directorate of Risk Management, Environmental Control and Engineering Division is responsible for establishing policy and maintaining oversight to ensure compliance with all federal and state regulations.
- The Environmental Program is divided into the following categories: air, wastewater, ground water, and solid/hazardous waste.
  - Air emissions originate from painting operations, coal and gas/oil fired boilers, grit blasting, and open burning/open detonation (OB/OD) of specification conventional ammunition.
  - There are two wastewater treatment plants with a total capacity of 520,000 gallons per day.
  - There is a remedial ground water program with plans to treat up to 70,000 gallons per day of contaminated ground water from 4 areas.
  - The hazardous waste program consists of storage areas for waste generated by industrial operations, operation of the OB/OD units, and the Download/Reconfiguration Facility.
- The Anniston Chemical Agent Disposal Facility (ANCDF) is approximately 35 percent complete and which will eventually be used to destroy the portion of the U.S. chemical munitions stockpile stored at Anniston Army Depot.

- The depot's industrial area is listed on EPA's National Priority List (NPL) for cleanup. The cleanup process, defined by the Federal Facilities Agreement (FFA), will ensure that contaminated areas are remedied to an acceptable level of risk to human health and the environment. The Army's goal is to accomplish activities at ANAD by the year 2007.

### 1.1.2 PLANNED TECHNOLOGICAL ENHANCEMENTS

#### Manufacturing Techniques/Processes:

- The *Automated Liquid Penetrant Inspection System* will be used to perform liquid penetrant inspection of AGT 1500 Turbine Engine components for cracks and other defects during overhaul. Automation of the penetrant inspection process will increase inspection efficiency and reliability.
- The *Positive Pressure Vacuum Furnace* will be used for vacuum brazing and heat treating of AGT 1500 Turbine Engine components. The system will be equipped with positive pressure cooling capabilities that will increase process efficiency and allow heat treatment of a wider range of materials.
- The *Sodium Bicarbonate Cleaning* process will reduce the cycle time for cleaning subassembly components. In addition, the generation of hazardous chemicals and waste associated with other cleaning processes will be reduced.

#### Repair Techniques/Processes:

- The *High Velocity Oxygen Fuel (HVOF) Flame Spray System* is used to apply high-density wear resistant coatings to unserviceable (worn) components. HVOF coatings are used as an alternative to hard chrome plating and will help eliminate the hazardous waste associated with the chrome process.

### 1.1.3 COMMODITIES AND PRODUCTS

#### Aircraft

Accessories and Components  
Armament  
Avionics  
Engines  
General Purpose  
Metal Airframe

#### Automotive Equipment

Accessories and Components  
Armament  
Communications  
Electronics  
Engine  
Fire Control

## **Aircraft**

Non-Metal Airframe  
Support Equipment

## **Combat Vehicles**

Accessories and Components  
Armament  
Communications  
Fire Control  
General Purpose  
Hull & Chassis  
Power Plants  
Support Equipment

## **Communications/Electronics**

Accessories and Components  
Electronics  
General Purpose  
Power Plants GTE  
Power Plants Recip  
Radar  
Shelter/Housing  
Support Equipment

## **Ordnance**

Accessories and Components  
Chemical & Bacteriological Weapons  
Conventional Arms & Explosives  
Engines  
Guns & Artillery  
Small Arms

## **Automotive Equipment**

Hull & Chassis  
Support Equipment

## **Construction Equipment**

Accessories and Components  
Communications  
Electronics  
Engine  
Hull & Chassis

## **General Support Equipment**

Accessories and Components  
Electronic Test Equipment  
Heating & Air Conditioning  
Machine Tools  
Power Plant/Generator Set GTE  
Power Plant/Generator Set Recip  
Rail Equipment - Locomotives  
Rail Equipment Rolling Stock  
Topographic  
Troop Support Equipment

## **Ships**

Communications & Electronics

### **1.1.4 PROCESSES AND TECHNOLOGIES**

#### **Cleaning and Stripping**

Abrasive Flow  
Agricultural Media Blast  
Alum Oxide  
Bake Oven  
Citric Acid  
Glass Media Blast  
Grit Blast  
High Pressure Water Washing  
Ivadizer  
Micro Blast  
Non-Hazardous Chemicals  
Plastic Media Blast  
Sand Blast  
Steam  
Steel Media Blast  
Ultrasonic  
Vapor Degreaser  
Vibratory Finishing  
Water Jet

#### **Fabrication/Repair**

Air Conditioning - Freon  
CAD/CAM - Artwork-Drilling/Lathe/Punch

#### **Fabrication/Repair**

EProm/Prom Programming  
Fiber Optics

#### **Fabrication/Repair**

CAD/CAM - Artwork-Flat Wire Cables  
CAD/CAM - Artwork-Printed Circuit Board  
CAD/CAM - Certified Soldering  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Drilling/Lathe/Punch  
CAD/CAM - Engineering Analysis  
CAD/CAM - Engineering Design/Drawings  
CAD/CAM - Forming/Machining/Milling  
CAD/CAM - Grinding  
CAD/CAM - Printed Circuit Board  
CAD/CAM - Sheetmetal  
CAD/CAM - Vertical Internal Grinder  
Certified Soldering  
Chromic & Phosphoric Acid Anodizing  
Class 100,000 Clean Room  
CNC Forming/Machining/Milling  
Coaxial Cable  
Hazardous Chemicals  
Cryptographic  
Cutting - Laser

Cutting - Oxyfuel  
Cutting - Plasma

Cutting - Water Jet  
Electronic ATE

#### **Fabrication/Repair**

Rubber Products  
Shot Peening - Automatic



Flame Spray  
Flexible Machining Cell  
Forming/Machining/Milling  
Hard Anodizing Sulfuric Acid  
Heat Treating  
Hybrid Microcircuit  
Ion Vapor Deposition  
Ivadizer  
Metal Finishing  
Metal Spray

### **Fabrication/Repair**

Metrological  
Nickel Sulfamate  
Nickel Watts  
Optics  
Phosandodize  
Photo Etching  
Plasma Spray  
Plating - Anodize  
Plating - Cadmium  
Plating - Cadmium/Chromium  
Plating - Chromium  
Plating - Copper  
Plating - Electro  
Plating - Electroless Nickel  
Plating - Gold (Brush Plate)  
Plating - Gold/Silver  
Plating - Hard Chrome  
Plating - Nickel  
Plating - Silver/Cadmium  
Plating - Tin/Lead  
Plating - Titanium  
Plating - Zinc  
Precision Balancing  
Printed Circuit Board  
Robotic Auto Cleaning System  
Robotic CARC Painting  
Robotic Painting  
Robotic Plasma Spray - Conventional  
Robotic Sand Blast  
Robotic Welding

Sulfuric Anodizing  
Test Program Sets  
Tool and Die  
Tube Bender  
Vacuum Brazing  
Welding - Arc  
Welding - Certified Ballistic  
Welding - Dabber TIG  
Welding - Electron Beam  
Welding - Laser

### **Fabrication/Repair**

Welding Plasma  
Welding TIG, MIG  
Wiring Harness

### **Test and Inspection**

Air/Fuel Flow  
Bearing Process  
Bonding Test  
Calibration  
Dynamic Blade Testing  
Dynamometer -Engine  
Dynamometer - Transmission  
Eddy Current  
Electron Microscope  
Electronic ATE  
Electronic ATE - Analog  
Electronic ATE - Digital  
Electronic ATE - Ditmco  
Electronic ATE - Ditmco 9100  
Electronic ATE - EQUATE  
Electronic ATE - GenRad  
Electronic ATE - STE-FVS  
Electrostatic Discharge  
Engine Test Cell - Automated  
Fiber Optics  
Firing Range  
Fluorescent Penetrant - Automated  
Fluorescent Penetrant - Manual  
Gymnasticator

## **Test and Inspection**

Hydraulic Systems

Hydrostatic

Laser Test Range

Load Test

Magnetic Particle

NDI Magnetic Particle

Radiographic Analysis

Radiography - Gamma

Slopes

## **Test and Inspection**

Spectrographic Analysis

Stress

Test Tank

Test Track

Transmission Test Cells - Automated

Type II Calibration Laboratory

Ultrasonic - Automated

Ultrasonic - Manual

Video Inspection Probe

X-Ray - Film

X-Ray - Real Time

## **1.2 Corpus Christi Army Depot (CCAD), Corpus Christi, Texas**

### **1.2.1 OVERVIEW**

#### **History:**

- Opened in 1961 as an aircraft overhaul and repair facility with a work force of 1,000 military and civilian employees.
- Formally commissioned as the US Army Aeronautical Depot Maintenance Center (ARADMAC).
- In 1967, changing needs and increased demand for helicopter repair resulted in a mission change, requiring the phasing out of fixed wing aircraft repair and the starting up of a complete rotary wing program.
- In 1974, it was renamed Corpus Christi Army Depot (CCAD) with a work force of approximately 4,000 employees.
- Today the depot is the only aeronautical overhaul and repair facility for the Army.

#### **Mission:**

- Performs overhaul, repair, modifications, retrofit, and modernization on rotary wing aircraft, engines and components for all Services and the foreign military sales program.
- Provides worldwide on-site maintenance services, aircraft crash analysis, lubricating oil analysis, and chemical and metallurgical support. Serves as the depot training base for 1,000 active duty, reserve, National Guard, and foreign military personnel annually. CCAD's major weapon system core workload consists of:

#### **Aircraft**

H-60A Black Hawk  
CH-47D Chinook  
AH-64A Apache  
OH-58D Kiowa  
AH-1W Cobra  
MH-60K Pavehawk  
SH-60B/F Seahawk  
UH-1N Huey

#### **Engines**

T55-L-712  
T53-L-13B  
T53-L-703  
TF40B  
T63-A-720, T63-A-700  
T700-GE-700, T700-GE-701, T700-GE-401

#### **Other**

Supports all the major aircraft components on the weapon systems including transmissions, gearboxes, rotor heads, rotor controls, avionics, instrumentation, hydraulics, bearings and electrical components.

**Location:**

- The depot is a tenant on the Corpus Christi Naval Air Station, Corpus Christi, Texas.
- Corpus Christi is located on Corpus Christi Bay, about 5.5 air miles from the Gulf of Mexico.
- City is about 225 miles southwest of Houston, a major industrial center and seaport, and about 150 miles southeast of San Antonio.
- Republic of Mexico is situated approximately 160 miles south of the city.
- Depot's strategic military location on the Gulf of Mexico facilitates rapid access to Mexico, the Caribbean, Central and South America.
- Favorable CONUS location in the south central United States makes CCAD nearly equidistant from both the east and west coasts of the United States.
- Central, Gulf Coast location facilitates depot maintenance support to installations throughout the continental United States and across the Atlantic and Pacific Oceans.
- Climate is moderate to semi-tropical with a mean temperature of 72 degrees Fahrenheit. Normal rainfall is 30 inches a year. Good flight-test weather between 328 and 345 days per year. Airspace in south Texas is unencumbered by commercial and military air traffic congestion.

**Size:**

- Consists of 140 acres, with 126 acres dedicated to maintenance.
- 51 buildings, with 32 buildings for maintenance operations. Total available building space is 2,115,902 SF with 1,758,000 SF dedicated to maintenance.
- Maintenance facilities have a replacement value of \$547M, with plant equipment valued at \$160M.

**Workforce/Payroll:**

- Workforce of more than 2,700 civilian employees and 7 military.
- 15 percent female and 85 percent male.
- Annual budget of about \$348.7M, with an annual payroll of approximately \$145M.

**Transportation Access:**

- Corpus Christi is situated at the junctions of Interstate Highway 37 and US Highways 77 and 181, that provide ideal access for land transportation.
- Serviced by 20 motor freight lines and three railroads.
- The Port of Corpus Christi is a deep-water port and is the sixth largest, in terms of tonnage, in the United States. The port and connecting Intracoastal Waterway can be used to transport large quantities of materiel to and from theaters of operation.
- Corpus Christi International Airport, located 15 miles north of CCAD, is served by four major airlines.

- Corpus Christi Naval Air Station has an all weather airfield with eight miles of runway. The airfield provides twenty-four hour support to cargo aircraft including the C-5A.

**Environmental Constraints:** CCAD complies with all applicable federal, state and local environmental regulations. The depot accomplishes its mission with sustained priority given to tracking all hazardous wastes from point of generation through final disposal. Comprehensive waste management procedures assure waste separation and integrity. As a tenant aboard Corpus Christi Naval Air Station, we support the host in conserving and preserving the area's natural resources so they will be available for present and future generations.

The following are all local, state and federal legislation that are in effect at CCAD.

- Clean Air Act
- Clean Water Act
- Spill Prevention and Cleanup
- Resource Conservation and Recovery Act - Hazardous Waste
- Solid Waste Landfill Disposal
- Toxic Substance Control Act
- Safe Drinking Water Act
- Noise Pollution Control
- Federal Insecticide, Fungicide and Rodenticide Act

**Local Industries:** CCAD is the largest industrial employer in south Texas. Industries in the area include agriculture, fishing, shrimping, petroleum, petrochemical, maquiladora, industrial construction, deep-water port, and tourism. The principal products produced are petroleum refining products, petrochemical, chemical and allied products. Also, the Port of Corpus Christi handles a variety of commerce products, including petroleum products, chemicals and grain.

## **1.2.2 PLANNED TECHNOLOGICAL ENHANCEMENTS**

### **• Main Rotor Blade Balance Facilities:**

Blade Balance Facilities, commonly referred to as whirl towers or whirl stands, are used to dynamically and aerodynamically balance main rotor blades. After the overhaul and/or repair process, blades are mounted on whirl towers and turned (whirled). The balance, track and integrity with each other are checked and/or adjusted prior to installation on aircraft. CCAD currently has one operational tower and one under construction. The operational tower supports the UH-60A (Black Hawk), SH-60B (Sea Hawk) and CH-47D (Chinook) balancing requirements. The new tower will support Black Hawk and Sea Hawk requirements.

- **Industrial X-Ray System:**

This is a state-of-the-art real time radiographic x-ray system for inspection of U.S. Army bonded composite helicopter rotor blades. The system provides a closed loop, high stability x-ray generating sub-system and 100 kV x-ray tube head; a host computer and microprocessor based x-ray control unit. There is also an x-ray image intensifier, optical coupling, and color video closed circuit TV system; a super VHS video cassette recorder, monitor, and video printer; a mechanical manipulation system for the x-ray tube head and radiosopic image detector; and a radiation shielded blade x-ray enclosure and control room with safety system.

- **High Velocity Oxygen - Fuel Metallizing (HVOF):**

This process represents the state-of-the-art in the application of thermally sprayed metallic coatings. The process uses high kinetic energy along with controlled thermal energy to produce coatings with lower porosity, higher bond strengths, and lower residual stresses when compared to current plasma sprayed coatings.

- **Waterjet Paint Stripping:**

This process will use focused ultra-high water pressure to remove painted coatings. The spent water will be recycled within the paint stripping system, significantly reducing the hazardous waste stream being produced with current methods of paint/coatings removal.

- **Local Area Network:**

Replaced in 1998, the local area network is comprised of a new infrastructure of single-mode fiber optic cable, category 5 twisted-pair cable, manhole and conduit system, and electronics. The network utilizes Asynchronous Transfer Mode (ATM) technology to handle data, voice and video needs. The network support framework has also been updated with the latest in automated monitoring and remote management tools.

- **Adhesive Bonding Center:**

The Department of the Army Advanced Composites Facility at CCAD houses the adhesive bonding center. Another element of this facility includes a composites adhesive laboratory. The laboratory will provide real time production analytical support. Equipment includes computer controlled tensile testing, dynamic mechanical analysis, fourier transform infrared analysis, high pressure liquid chromatography, thermal analysis, rheometry and environmental weather simulation chambers for durability testing of adhesive bonds.

- **Wheat Starch Blasting (WSB):**

Another element of the adhesive bonding center is the Wheat Starch Blasting room. CCAD developed an equipment specification and economic analysis package and procured a Wheat Starch Blasting (WSB) room; operation began in November 1996.

The equipment is manufactured out of mild steel and uses 12/30 mesh Wheat Starch media to strip polyurethane and epoxy coatings from fiberglass and thin-skinned aluminum substrates. The unit can strip paint from both composite and aluminum airframe structures. CCAD procured the Wheat Starch Blast room because of the need to strip coatings from delicate substrates like composites. Composite structures have been damaged in the past by Plastic Media Blasting (PMB) and by chemical strippers.

The blast room's 10 ft H x 12 ft W x 30-ft L dimensions allows helicopter main rotor blades to be stripped also. Hardened Epoxy/Fiberglass structures can be stripped, with results that are as good as those that are stripped via laser stripping technology. A multitude of parts can be stripped and maintenance costs are considerably less than the cost associated with automated high tech systems.

The UH-60 Black Hawk, SH-60B Seahawk, MH-60 Pavehawk, AH-64 Apache, and the AH-1W Super Cobra Whiskey model helicopters are all supported; these aircraft have many composite structures.

The system cost \$400,000 and 80% of the man hours previously used to Plastic Media strip, chemical strip, and hand sand composite repair structures are being saved by this new process.

- **1,1,1 Trichloroethane (TRICO) Vapor Degreasing Alternatives:**

Environmental laws have phased out the production, and thus the use of 1,1,1 Trichloroethane and Freon-113; both products were widely used as part cleaners during the early 80s.

The classic open top vapor degreaser is now being designed in what is called a "Tight Designed Degreaser". This new design reduces diffusion loss of solvent gases via the use of a more complete enclosure, the use of dehumidifying coils (super cooling condensing coils), and the use of a carbon absorption unit, etc.

CCAD awarded a contract in August 98 to procure a "Tight Designed Vapor Degreaser". The system is projected to use n- Propyl Bromide to clean aircraft parts. The new system will reduce energy costs over aqueous cleaning systems by 90% and prevent corrosion of steel parts during the cleaning process.

- **Laser Paint Stripping of Blades:**

The system is comprised of a 2 kW pulsed carbon dioxide laser, automated controls and a waste handling system. It will be used to remove paint, primer, and adhesives from metal and composite helicopter blades.

- **Automated Aircraft Paint Stripping (AAPS) System:**

The system will utilize a pulsed xenon flash lamp combined with a CO<sub>2</sub> pellet blast to effectively remove paint, primer, adhesives and abradable coatings from DOD helicopters. The process, known as FlashJet®, is applied using a 7-axis gantry robot system. The process strips multiple paint and primer layers, paint colors, and varieties of paint without damage and meet all OSHA, EPA, and state of Texas environmental regulations.

- **Waterjet Metalspray Stripping System:**

This process will use a six axis robot to direct up to a 55,000 pounds per square inch gage (psig) stream of water to remove flame sprayed coatings from steel parts. The system will be capable of removing metalspray from cooling plate knife seals without damaging the knife-edges. Additionally, the system will be used to remove overspray from T700 compressor cases by precision stripping.

- **Nitrogen Ion Implantation:**

The system delivers nitrogen ions excited to 1X10<sup>17</sup> kilovolts at 39 milliamperes. These nitrogen ions are then imbedded or implanted into surface of machine cutting and grinding tools to increase wear resistance. Initial testing has shown a four-fold increase in the life of the tools after implantation.

- **Aluminum Ion Vapor Deposition System:**

The system applies a 99.98 percent pure aluminum coating to steel parts inside a vacuum chamber. The system is completely automated and is controlled by an MS-DOS based computer, which controls all functions of the system. The process replaces the cadmium coating without generating any hazardous waste.



### **1.2.3 COMMODITIES AND PRODUCTS**

#### **Aircraft**

Accessories and Components  
Armament  
Avionics  
Engines  
General Purpose  
Metal Airframe  
Non-Metal Airframe  
Support Equipment

### **1.2.4 PROCESSES AND TECHNOLOGIES**

#### **Cleaning/Stripping**

Abrasive Flow  
Glass Media Blast  
Grit Blast  
Hazardous Chemicals  
High Pressure Water Washing  
Non-Hazardous Chemicals  
Plastic Media Blast  
Steam  
Ultrasonic  
Vapor Degreaser  
Vibratory Finishing

#### **Fabrication/Repair**

Automatic Shot Peening  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Drilling/Lathe/Punch  
CAD/CAM - Engineering Analysis  
CAD/CAM - Engineering Design/Drawings  
CAD/CAM - Forming/Machining/Milling  
CAD/CAM - Grinding  
CAD/CAM - Sheetmetal  
Certified Soldering  
Chromic & Phosphoric Acid Anodizing  
Class 100,000 Clean Room  
Cutting - Laser  
Cutting - Plasma

#### **Fabrication/Repair**

Cutting - Water Jet  
Electronic ATE  
Flame Spray  
Forming/Machining/Milling  
Foundry - Non-ferrous  
Hard Anodizing Sulfuric Acid  
Heat Treating  
Ion vapor Deposition  
Metal Finishing  
Metrological  
Plasma Spray  
Plating - Cadmium

Plating - Cadmium/Chromium  
Plating - Electro  
Plating - Electroless Nickel  
Plating - Gold/Silver  
Plating - Hard Chrome  
Plating - Nickel  
Plating - Titanium  
Plating - Copper  
Precision Balancing  
Printed Circuit Board  
Robotic CARC Painting  
Robotic Metal Spray  
Robotic Metalizing  
Robotic Painting  
Robotic Plasma Spray - Conventional

**Fabrication/Repair**

Vacuum Brazing  
Tube Bender  
Tool and Die  
Test Program Sets  
Rubber Products  
Welding - Plasma  
Welding - Laser  
Welding - Electron Beam  
Welding - Dabber TIG  
Welding - Arc  
Welding - TIG, MIG  
Wiring Harness

**Test and Inspection**

Air/Fuel Flow  
Aircraft Rigging  
Bearing Process  
Bonding Test  
Calibration  
Dynamic Rotor Blade Testing  
Dynamometer - Engine  
Dynamometer - Transmission  
Eddy Current  
Electron Microscope  
Electronic ATE - Analog  
Electronic ATE - Digital  
Electronic ATE - Ditmco  
Engine Test Cell - Automated  
Fluorescent Penetrant - Manual  
Hot Air Test  
Hydraulic Systems  
Laser Measuring  
NDI Magnetic Particle  
Spectrographic Analysis  
Transmission Test Cell - Automated  
Ultrasonic - Automated  
Ultrasonic - Manual  
Video Inspection Probe  
X-Ray - Film  
X-Ray - Real Time

### **1.3 Letterkenny Army Depot (LEAD), Chambersburg, Pennsylvania**

#### **1.3.1 OVERVIEW**

##### **History:**

- LEAD was conceived in the hectic pre-war atmosphere of 1941, when America began gearing up for war. Realizing the forthcoming deluge of war materiel would swamp existing storage facilities; the War Department laid plans for 12 large, new ordnance depots. Letterkenny Township, Pennsylvania, was chosen as one site because of its location, close to the major ports of the eastern seaboard, yet far enough inland to make enemy attack unlikely. In addition, the site offered good rail connections and an adequate water supply.
- Letterkenny received its first shipment of ammunition on 23 September 1942, less than nine months after construction began. By 1943 the installation had hit full stride. When the war ended in August 1945, Letterkenny had shipped more than 3 million tons of ammunition and supplies, and had made maintenance modifications on more than 1,300 tanks.
- In 1948 the depot began reworking guns and fire control equipment as well as combat and general purpose vehicles. The installation experienced another surge of activity during the Korean War years, when the work force swelled to 6,500 persons. These years also saw a construction boom at the depot that included a large, new maintenance building. The introduction of missile system repair in the late 1950s continues to provide the depot with growth into the next century.
- Because of missile expertise, knowledge, and infrastructure, the Defense Depot Maintenance Council (DDMC) directed that LEAD become the consolidated tactical missile maintenance depot for DOD. This is documented in the Joint Service Business Plan, February 1991, and the DDMC Corporate Business Plan, May 1991. Public Law 101-510, Base Realignment and Closure (BRAC) directed in 1993, that all tactical missile depot repairs be performed at LEAD. Workload for nineteen different missile systems has transitioned to LEAD since 1993.

**Mission:** The major missions that have evolved at Letterkenny are vehicle and missile maintenance and ammunition. The maintenance mission provides repair, overhaul, and modification and/or conversion of tactical missile systems, self-propelled howitzers and associated sub-assemblies and support equipment. Repair, overhaul, and modifications are also performed on High Mobility Multipurpose Wheeled Vehicles (HMMWV), Heavy Expanded Mobility Tactical Truck (HEMTT), trailers, and shelters associated with ground based missile systems. Letterkenny, in partnership with United Defense Limited Partnership produces the PALADIN M109A6 self-propelled howitzer. Letterkenny is the Department of Defense depot for the following missile systems: HAWK, PATRIOT, TOW Bradley, Ground TOW, TOW Cobra, MLRS, LCSS, SHILLELAGH, and ATAS. LEAD also serves as the Center of Technical Excellence (CTX) for PALADIN, HAWK, PATRIOT, ATACMS, SIDEWINDER, MAVERICK, PHOENIX, SPARROW, HELLFIRE, and Pollution Prevention for Paint Operations. LEAD maintenance also provides project development and design service, plus training for customers and technical assistance. LEAD further provides leadership in the analysis of maintenance programs and in executing major initiatives to improve

quality, cost and productivity. LEAD also provides support for reserve component training and worldwide NBC air filtration system support.

The ammunition mission includes receiving, storing, maintaining, and issuing general supplies and ammunition. Depot ammunition operations include all types of class V items from small arms ammunition to large bombs and missiles. Through a Depot Maintenance Interservice Support Agreement, Letterkenny up-rounds SPARROW, HARM, and SIDEWINDER missiles and performs wing modifications on Sparrow missiles. Demilitarization of ammunition at LEAD destroys obsolete or hazardous bulk explosives as well as Class A, B, and C, ammunition by demolition, burning, or deactivation furnace.

**Location:**

- Letterkenny is located in south central Pennsylvania approximately 5 miles north of Chambersburg and 25 miles west of Gettysburg.
- LEAD is ideally located to provide worldwide service through major distribution points located within a 100-mile radius. These distribution points include Baltimore Harbor, Baltimore/Washington International Airport, and military airfields at Martinsburg ANGB and Harrisburg ANGB.

**Size:**

- Total installation size at LEAD is 19,243 acres of Army owned-in-fee land. Land acreage is as follows: ammunition storage, 11,822; industrial operations, 2,306; safety zones, 4,792; and recreation, 323.
- LEAD has a total of 1,866 buildings. There are 1,433 permanent buildings of which 902 are ammunition storage igloos located in the ammunition storage area. Of the total buildings, 683 are located in the industrial operations area.
- There is 1,107,610 square feet of building space dedicated to maintenance operations.
- The real property inventory value of the installation is \$129,137,300.

**Workforce/Payroll:**

- Work force and strength at the end of fiscal year 1998 was 1,778.
- The number of military personnel assigned to LEAD is 3.
- LEAD impacts the local economy with an approximate \$93.3M payroll.

**Transportation Access:**

- Interstate Route 81 and US Routes 11 and 30 serve the general area and are within five miles of the main entrance to the depot.
- There are more than 50 major truck lines serving the depot.

- Letterkenny's location provides highway access to convenient seaports of embarkation at Dundalk Marine Terminal, Baltimore, Maryland (80 miles); Military Ocean Terminal, Bayonne, New Jersey (215 miles); Naval Weapons Station, Earle, New Jersey (200 miles); and Military Ocean Terminal, Sunny Point, North Carolina (474 miles), which is the primary DOD receipt point for Class V.
- The Baltimore and Ohio Railway which is part of the chessie system, serves LEAD. Government track connects with the chessie system track at the extreme southeast section of the depot. The government performs all internal switching. The chessie system has a freight station at Culbertson, Pennsylvania, east of the depot along State Route 433. The Railway Express Office for Class A or B ammunition is Harrisburg. Interchange service is provided with Conrail and the Norfolk and Western Railway.
- The depot has a 100 feet by 100 feet helicopter landing pad.
- Military fixed wing aircraft and helicopters utilize the Chambersburg Municipal Airport located one mile south of the depot.
- Letterkenny is close to the Harrisburg (55 miles), Baltimore (70 miles), and Washington County Regional (25 miles) airports.

**Environmental Programs:** The requirement to operate in compliance with all applicable environmental laws and regulations is integral to each organization on the installation. The Environmental Management Division has oversight responsibility and the responsibility for ensuring that the requisite operating permits and procedures are complete, current and accurate. LEAD is in the process of implementing an ISO 14000 based environmental management system, which will further integrate pollution prevention and stress continual improvement based on a philosophy of environmental stewardship that goes beyond compliance.

### **1.3.2 SIGNICANT EXISTING/CURRENT CAPABILITIES**

- **Overhaul/Refurbishment of High Pressure Argon Cylinders:**

This process is located in Building 370. The high-pressure argon cylinder works between 3,500 and 6,000 PSI. The cylinder is utilized on both the Avenger and Air-to-Air Missile Systems. When LEAD receives the cylinder, a file is created in Word Perfect on the personal computer to document any conditions of the cylinder. LEAD proceeds in the process by doing a proof pressure test to 10,700 PSI, which establishes structural integrity of the reservoir. Upon completion of this test, all fittings are removed and cleaned in an ultrasonic cleaner. Then the fittings are reassembled in the cylinder and placed in an oven while a vacuum is pulled on the cylinder for removing any contaminates. To verify that no contaminates are within the cylinder, the gas from the cylinder is ran through a particle counter and fourier transform infrared (FTIR) spectrometer. Then the file from the FTIR is brought into a program called Multi-Comp (MCOMP). MCOMP will detect down to 1 part per billion; however, LEAD is only utilizing this device to 1 part per million. The contaminates that are being sought are carbon dioxide, water and total hydrocarbons. Once this check has been performed to the drawing specifications, the cylinder is repressurized to 5,000 PSI

and packaged for customer delivery. Also, if a cylinder has been damaged on the fiberglass cover or on the ends, the depot will repair these problems. This program is the first of its kind within DOD.

- **Multilayer Circuit Card Repair and Test:**

The electronics shops division has the capability to repair multilayer circuit cards down through three layers. LEAD personnel have the option of using lap flow (dissolving the epoxy layers) or a grinding method when repairing the multilayer boards. Associated equipment includes: modern PACE equipment, micro-blast (soda or walnut shell) equipment to remove conformal coatings, aqueous circuit card cleaning equipment, hot jet soldering equipment for surface mount technology circuit card repair, wave soldering equipment, 15 to 30 power microscopes for miniature soldering, board and chip EPROM programming and validation test equipment, and bed-of-nails and edge connector based test equipment. All personnel who use soldering techniques are certified for MIL-STD 2000 soldering.

- **DITMCO:**

A programmable automatic continuity and insulation breakdown tester to analyze cable, wiring and naked rack modules, supports the entire harness operation. Testing capacity is up to 10, 000 pins per unit. LEAD also develops test programs in support of the DITMCO test capability.

- **Automated Test Equipment (ATE):**

LEAD utilizes a large complement of ATE supporting depot level repair of seventeen different missile systems. The test equipment provides precision computer controlled test, diagnostics, and repair of both analog and digital circuitry. Test capabilities range from circuit cards to missile guidance systems and lower level assemblies to complete ground based radar systems. An entire complement of specialized microwave test equipment is also available. A major part of Lead's massive capital equipment expenditure is invested in automated test equipment. LEAD has acquired over 100 million dollars of ATE to support tactical missile maintenance.

- **28-Acre Radar Testing Site:**

HAWK and PATRIOT missile systems are tested at the radar test site, a specially designed facility that simulates a tactical emplacement. The system is first put through the paces of daily, weekly, and monthly checks. After a series of tests and checks, systems integrated check out (SICO) is begun. This procedure puts the system through an exhaustive test, which includes a series of preliminary checks, target acquisition and identification, concluding in a simulated missile launch. The first "hot run" debugs the system and locates any faults not detected during earlier simulator checks. To further assure the quality and reliability of the system, quality assurance personnel repeat the entire SICO before final acceptance.

- **Nearfield Antenna & Compact Test Pattern Range:**

The antenna pattern test range provides year round, state-of-the-art technology in the mechanical and electrical boresighting of continuous wave acquisition radar, range only radar, and high power illuminator antennas. It has wide application for a variety of systems and support to other agencies. Computer controlled equipment generates, monitors, and graphs radiation patterns to ensure proper receiver/transmitter alignment.

- **Wiring Harness Fabrication:**

The electronics shops division has the capability to fabricate any wiring harness, from the smallest chassis harness to the largest high-voltage cable, including transitions and connector potting and automatic braiding. On the HAWK program for example, one of the larger harnesses requires 360 work-hours to fabricate, while a HAWK triad battery requires the fabrication of 290 harnesses. Automatic test equipment capabilities are available for insulation resistance, continuity, and corona.

- **Electric Motor Reconditioning:**

The electronics shops division disassembles, reconditions, rewinds, modifies, assembles, and tests electric motors including the many motors found in the Patriot system. All motors including DC through 400 AC are completely reconditioned. Testing capabilities include a dynamometer load test, a mechanical vibration analyzer, and dynamic balance and power analyzer.

- **Soldering Capabilities Including PACE Workstations:**

The electronics shops division possesses extensive soldering and soldering rework capabilities certified to MIL-STD 2000. Highly skilled operators use statistical process control, high power zoom-stereo microscopes, and state-of-the-art soldering workstations for soldering of through-hole and fine pitch surface-mount printed circuit boards. Environmental controls include temperature and humidity controls, 100,000 class clean rooms, and class 100 laminar flow benches. Automated test equipment verifies PCB functionality.

- **Nitrogen Supply System:**

This system provides a bulk source of cryogenic liquid nitrogen which is vaporized into a gaseous form, pumped to the required pressure, and then stored for use on demand by the test consoles which is used to test and repair various missile systems. The system is capable of supplying gaseous nitrogen at a supply pressure of 3400 pounds square inch gage (psig) and a continuous flow rate of 250 standard cubic feet per minute (scfm). In addition, the system is also capable of maintaining a peak flow rate of 550 scfm at a supply pressure of 3400 psig for a minimum of 30 minutes. The system consists of an 11,000 gallon bulk liquid nitrogen tank, two nitrogen vaporization systems, two high pressure pumps, eight hour minimum gas storage tubes and piping/connections/control

system to make one nitrogen supply system. The nitrogen supply system is essential for the testing of the guidance and control sections (GCS) components of the Sidewinder missile. The nitrogen supply system provides capability to perform depot level maintenance of the Sidewinder, Maverick, and Phoenix missiles.

- **Laser Test Facility:**

Letterkenny Army Depot installed a laser test facility in 1995 in the electronic shops division. This facility meets Class 4 laser requirements and Class 10,000 clean room requirements. The facility encompasses 480 square feet of rebuild and testing space. The unit is a self-contained environmentally controlled room having a relative humidity of 30 to 50 percent and temperature of 72 +/- 5 degrees Fahrenheit.

- **Generator Test Load Bank System:**

A generator test load bank system was installed at Letterkenny Army Depot in September 1994. This unit consists of a supervisory control and data acquisition system (SCADAS), capable of automatically sequencing a generator set through the entire acceptance test. The SCADAS impresses the required resistive and/or reactive loads on the generator sets and then monitors and analyzes the output response of the generator under load. A hard copy of test results can be provided. The 300KW load bank is capable of providing loads required by DOD for the acceptance testing of generator sets up to 200KW. Characteristics of this load bank are 0-100 percent resistive and 0-100 KVR loads for 120/208V or 240/416V at 50, 60, and 400 hertz; shock loads of 100 percent, 75 percent, 50 percent and 25 percent of rated load all at .8 power factor; loads of 125 percent of rated load at unity power factor; and the capability to load individual phases of the generator set.

- **Vibration Test System:**

The vibration test system, procured by LEAD, is designed to adequately perform random and sine testing of electronic components mounted in a test fixture bolted to a plate mounted vertically above the vibration generator. The electronic components and test fixture are rotated to achieve three (x, y, z) axis vibration testing. The vibration test system incorporates a power amplifier, vibration generator with integrated fixture mounting plate, control system, cooling system and feedback system to make on vibration test system. The vibration test system is required to stress test various missile systems.

- **Automated Data Collection System:**

This project facilitates the collection of configuration/parametric data associated with weapon system maintenance, and prototype design and analysis. LEAD supplies this information to NAVAIR-AWARS, Air Force-RAMS and the NAVSEA data collection systems. Letterkenny has taken the initiative in cooperation with the Navy and Air Force to establish an automated data



collection system, which will effectively allow interservice data transactions. This system tracks and maintains data for the following missile systems: SPARROW, SIDEWINDER, PHOENIX, HARM, STANDARD, MAVERICK and AMRAAM. The system provides required compatibility with other services and a common database for future expansion.

- **Fourier Transform Infrared Spectrometer (FTIR):**

The FTIR spectrometer provides LEAD the capability to refurbish the ATAS/SVML gas coolant reservoir (P/N 481-200526). This testing certifies the cleanliness of argon bottles used as a coolant in the launchers for the Stinger missile. This refurbishment shall be performed at least every five years from date of manufacture or whenever there is concern or evidence of damage to or malfunction of the reservoir.

- **Shielded Room Capability Interference Free Testing Environment:**

LEAD currently utilizes three shielded rooms for testing purposes. These rooms are required to reduce the interference radiating from the enclosed testing equipment. One room is required to shield the equipment used to test the HAWK amplifier-modulator-oscillator assembly (RF pallet) and other associated assemblies. Another room is required to shield the equipment used to test the PATRIOT microwave frequency converter assembly. LEAD also has the capability of testing, per MIL-STD 285, for the shielding effectiveness of PATRIOT shelters. The third room is utilized for testing of lower-level assembly of Sparrow missile guidance section.

- **Environmental Chambers/Clean Rooms:**

LEAD has various sized temperature chambers used for temperature stressing of electronic assemblies and missile rocket motors and to support cable connector potting processes. Maximum internal chamber size is 10' 6" by 10' 6" by 7' 10" with cooling capabilities down to -90F. A number of class 100,000 clean rooms exist within LEAD maintenance that are utilized for the refurbishment of Stinger argon bottles, and the overhaul of hydraulic components. LEAD also has class 10,000 clean rooms utilized for the repair of TOW, DRAGON, and MAVERICK missile components and a 1,000-class clean room for the repair of Sidewinder missile components.

- **Hydraulic Component Rebuild and Fabrication:**

LEAD has the capability to repair, rebuild, fabricate, and test hydraulic and pneumatic components such as motors, cylinders, compressors, solenoids, valves, electromechanical valves, solenoids, and hoses. Hydraulic and pneumatic testing can be done up to 30,000 psi (hydraulic), flow rates up to 25 gallons per minute (hydraulic), and pressures up to 3,200 psi (pneumatic). Coolant systems (glycol and insulating oils) are also repaired and tested in this area.

- **Hydraulic Pumping System:**

The hydraulic system is capable of providing a constant 3500-PSI with a flow of 2 gallons per minute (GPM). The unit incorporates visual and audible alarms at various locations throughout the system. Automatic shut downs are utilized in event of system failure. This system provides hydraulic fluid, under pressure to operate various consoles and components, located in a portion of electronic shop division.

- **Small and Large Recoil Gymnasticator:**

LEAD's Gymnasticator is capable of testing all conventional hydropneumatic recoil mechanisms from the M2 through the M174. This versatility allows LEAD to participate in major howitzer overhaul programs. The Gymnasticator is linked to computers for accurate, instantaneous readouts regarding terminal velocities and can pinpoint problems prior to test firing.

- **Transmission Test Stand:**

LEAD possesses two transmission test stands used to accomplish the test requirements of the M109A6 XTG-411 Paladin cross-drive transmission. The test stands generate drive power and dynamic loading of each output by hydrostatic pressure. Control consoles feature computerized data and storage. These test stands provide increased capability, accuracy, and reliability of cross-drive transmissions overhauled at LEAD.

- **Generator Test Stand:**

LEAD has a generator test stand capable of testing a wide variety of alternators, regulators, and starters, including the 650-ampere generator utilized on the Paladin

- **Engine Test Cell:**

Lead's computerized engine-testing capabilities automatically test gasoline, diesel, and multifueled engines from 125 to 1,000 horsepower.

- **Computer Numerical Controlled/Manual Data Input (CNC/MDI) Machining:**

LEAD currently has a wide range of versatile CNC/MDI machining capabilities to include turning, milling, grinding, punching, cutting, sawing, boring and waterjet cutting.

- **CNC Bridge Milling Machine:**

The Ingersoll machining center is designed to perform a full range of cutting functions on a wide variety of materials such as aluminum alloy, steel, titanium or advanced composites. The machine is a 7 axis, single head, vertical, adjustable rail Masterhead™ machining center, with dual tables.

The machine will perform intricate machining operations with 512 inches of X-axis, 152 inches of Y-axis, and 39 inches of Z-axis. The portal clearance is 128 inches from tabletop to ram face and 148 inches between column way covers. The machine is equipped with dual, independent worktables to minimize machine idle time. One table can be parked for setup, load, or unload while the second is used for machining. The two tables can be joined automatically for processing long work pieces. The machine ram has a 100 HP spindle motor with a speed range of 40 to 3000 Rpm's. Adjacent to the machine is one 72 pocket #50 taper Bertshe tool chain with tool changer, and one 4 station Ingersoll spindle unit transporter. Its portal type construction offers the greatest structural rigidity for high horsepower roughing cuts and accurate finishing cuts. The Masterhead™ concept, with spindle units, provides machining speed range to cover everything from high horsepower; low spindle speed cuts to the extremely high spindle speeds needed to take advantage of advanced cutting tools. Additional features such as computer-analyzed structures, hydrostatics and non-contact feedback systems enhance reliability and accuracy of the Masterhead™ machining center. With the Masterhead™ machining center versatility and flexibility accommodates medium and large part machining. It's the closet yet to a truly universal large machine tool.

- **Flat Surface Finisher:**

A CEMCO flat surface finishing system providing wet deburring and polishing capabilities has been installed in Bldg. 350 Annex at LEAD to meet the finishing requirements of various flat sheet metals to support numerous depot operations. The finishing system has features and components for deburring, radiusing, and polishing sheet metal. The state-of-the-art finishing system replaces the manual methods of deburring and sanding. The finisher has greatly enhanced Lead's sheet metal fabrication capabilities.

- **Circumferential Welder:**

Letterkenny Army Depot has installed a circumferential welder with a computer numerically controlled CNC 9500 system to perform submerged welding operations. The 9500 system controls four welding parameters simultaneously, welding current, arc voltage, wire feed speed and travel speed. An easy to use menu system allows the operator to create, preprogram and store in memory, up to 25 individual welding programs. The unit has a weld capacity of 10 inches in diameter and 10 feet long.

- **Coating and Depainting Capabilities:**

LEAD's painting operations include 40 painting facilities spread throughout the depot. These facilities range from small open-face booths and paint carousels to large drive-through booths up to 22 feet wide by 18 feet high by 60 feet long. LEAD's principle coating system is the Army's Chemical Agent Resistant Coating System (CARC). LEAD is experienced in the application of two components, water reducible and powdered epoxies, as well as single component and water reducible polyurethane to a wide variety of components and end-items. LEAD routinely performs

pattern painting and uses a multi-million dollar emissions control unit to support the use of specialty / non-compliant coatings.

LEAD removes old coatings by both chemical and mechanical means. Non-Methylene chemical depainting materials are used to chemically remove enamel, epoxy, polyurethane and plastisol coatings. The mechanical depainting facilities at LEAD include large drive-through booths, walk-in blast rooms, automatic rotary blast machines, and hand cabinets. The mechanical media used include steel, glass, agricultural, plastic and garnet.

- **Chrome Plating Capabilities:**

LEAD applies engineering plating, per FED SPEC QQ-C-320, through both conventional and reversible rack/conforming anode processes. Electroplating of black chrome, per MIL-C-14538, can also be performed. Parts with diameters up to 9 inches and lengths up to 7 feet are normally plated. Thickness from .0001 to .060 inches is applied. Metals commonly brush plated include chrome, nickel, copper, and cadmium. Complete pre- and post-machining processes are available.

- **Technical Measurement Facility:**

Within the vehicle rebuild complex at LEAD is located a technical measurement facility. The 836 square foot, environmentally controlled room houses various equipment utilized for precision measurements of machined material and components. Equipment includes a coordinate measuring machine with granite table, computer (with 3-D software), printer, and math coprocessor. This machine has infinite fine adjustment on all axis (x,y,z). Machine resolution is .000080 inch; display resolution for digital readout and computer is .0001 inch; repeatability is .0001; and work piece weight is 4,500 pounds. Also available is an optical comparator with 10 to 100 times magnification, a maintenance inspection center for the measurement of smaller parts, and a hardness tester.

- **Radiographic Inspection Facility:**

The radiographic (x-ray) inspection facility houses a 25-megavolt Betatron x-ray machine and a 320-kilovolt x-ray machine. The Betatron unit is located in a concrete chamber with 5- to 8-foot-thick walls and a 96-ton steel concrete filled door that moves on railroad type tracks. The Betatron unit can x-ray through 20 inches of steel and is used for inspection of large items; i.e., the interior of large rocket motors. The 320-kilovolt machine is used for smaller explosive/nonexplosive devices and has the capability to x-ray through 2 inches of steel.

The facility is constructed of concrete and steel. A 10-ton bridge crane and a 25,000-pound "track-tread" carrier are used for movement and placement of larger material. An area monitoring system is an integral part of the built-in radiation safety system.

The facility is equipped with three portable x-ray machines. It also has a darkroom that houses an automatic film processor with automatic chemical replenishment features and a unit to enable the recovery of silver from chemical solutions.

The facility is used primarily for explosive devices; however, gun tubes, self-propelled howitzer hulls, or major items requiring safety or quality inspections can be processed as well. Extensive savings in labor are possible if items can be inspected by x-ray rather than disassembled and visually inspected through a time-consuming process.

- **Real-Time Radiographic System and Radiation Enclosure:**

LEAD has a real-time radiographic system and radiation enclosure used to perform weld integrity inspections. The enclosure is located in the industrial complex, which eliminates the extensive handling associated with transporting assemblies to the x-ray facility, therefore reducing inspection time.

- **Vehicle Test Track Complex:**

A one-mile, macadam (asphalt) surface, closed loop oval test track accommodates the full dynamic and static testing of tracked and wheeled vehicles. The track includes straightaway and banked curves sufficient to allow full speed testing. The complex also includes 30/60 percent slopes, pivot steer spin pad (concrete), brake/acceleration area, turning radius (wheeled)/geared steer (track) area, undulation area, lockout cylinder area, fording/flotation pit, boresighting/synchronizing platform with slope, and a weapon's stabilization course. The track is also capable of accommodating numerous tracked and wheeled vehicles simultaneously. Two inspect/repair buildings provide six bays where timely repairs can be made to tested vehicles. An in-ground pit in one bay provides easy access for inspection/repairs to the components on the underside of vehicles.

- **Firing Range:**

The LEAD firing range can support functional firing of towed howitzers, self-propelled howitzers, tanks, and anti-tank missiles. Main gun capabilities include up to 8-inch weapons. The range presently supports the testing of 155mm M109s and 8-inch M110s, along with various other howitzers and recoil mechanisms. Capabilities also include small arms testing. The range is used for live firing of inert projectiles with the appropriate powder charges. The complex consists of a firing pad, an ammunition storage area (for daily firing), powder heating capability, an observation building, and an impact bunker. Full instrumentation exists for full functional and proof testing for artillery systems.

- **Optical Instrument Overhaul:**

The optical instrument overhaul program at LEAD is required to fully support the conventional fire control equipment associated with howitzers including obsolete telescopes and sighting devices used on some FMS to modern computer linked equipment. LEAD has maintained the skill base required to perform overhaul and repair associated with all howitzers. These journeymen must be able to hand-fit gear drives and mating surfaces to the most stringent tolerances, in addition to working with electronic controlled systems.

- **Tritium Facility:**

Located in building 14, the facility includes a tritium instrument repair room approximately 20 feet by 20 feet. This room is specially designed and designated for repair work related to self-luminous sources (tritium) used in fire control instruments. The NRC has licensed LEAD. The facility contains required tritium air monitors and fume hoods. All tritium instrument repair personnel are properly trained and skilled in repair/replacement of tritium light sources. Facilities also exist for the shipping, receiving, and storage of tritium items.

- **Chemical/Radiation Laboratory:**

The Chemical/Radiation Laboratory provides laboratory and consultant services for physical, chemical, radiological, environmental, and functional analysis of material in support of depot operations. These operations include the Army Oil Analysis Program, Radiation Protection Program, and the Quality Assurance Program.

- **Fiber Optic LAN System:**

The state-of-the-art fiber optic network ensures dependable service to network users and supports the data transmission requirements of the entire depot.

- **Joint Engineering Data Management Information Control System (JEDMICS):**

The JEDMICS system offers automated technical data storage and retrieval; electronically accessible by personnel involved in manufacturing/repair processes. Immediate access and hard copy output to all data stored in the repository is available to all depot personnel.

- **CAD/CAM:**

Computer Aided Design (CAD)- Pro-Engineering and AutoCAD software in conjunction with scanning technology is used for developing engineering drawings, floor plans, and technical data packages.

Computer Aided Manufacturing (CAM)- computer numerical control programming with CADD5 software and a direct numerical control system provide machine programs to the shop floor.

- **Special Service Capabilities-Soft Technology:**

Integrated Desktop Publishing-Ventura Publisher: Technical manuals, technical bulletins, depot maintenance work requirements, special procedures, engineering test procedures, repair parts and special tools list, quick response program, process instructions.

### **1.3.3 COMMODITIES AND PRODUCTS**

#### **Automotive Equipment**

Accessories and Components  
Armament  
Electronics  
Engine  
Fire Control  
Hull & Chassis  
Support Equipment

#### **Missile**

Accessories and Components  
Guidance System  
Missile Frame  
Payload System  
Solid Propulsion  
Support & Launch  
Surface Command & Control

#### **Combat Vehicles**

Accessories and Components  
Armament  
Communications  
Fire Control  
General Purpose  
Hull & Chassis  
Power Plants  
Support Equipment

#### **Ordnance**

Accessories and Components  
Conventional Arms & Explosives  
Engines  
Guns & Artillery  
Small Arms

#### **Communications/Electronics**

Electronics

#### **Construction Equipment**

Accessories and Components  
Communications  
Engine  
Hull & Chassis  
Heating & Air Conditioning

General Purpose  
Radar

Shelter/Housing

#### **General Support Equipment**

Accessories and Components  
Electronic Test Equipment

### 1.3.4 PROCESSES AND TECHNOLOGIES

#### **Cleaning/Stripping**

Abrasive Flow  
Agricultural Media Blast  
Alum Oxide  
Bake Oven  
Citric Acid  
Glass Media Blast  
Grit Blast  
Hazardous Chemicals  
Micro Blast  
Non-Hazardous Chemicals  
Plastic Media Blast  
Sand Blast  
Steam  
Steel Media Blast  
Ultrasonic  
Vapor Degreaser  
Vibratory Finishing

#### **Fabrication/Repair**

Air Conditioning - Freon  
Air Conditioning - Lithium Bromide  
CAD/CAM - Artwork-Flat Wire Cables  
CAD/CAM - Artwork-Printed Circuit Board  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Drilling/Lathe/Punch  
CAD/CAM - Engineering Analysis  
CAD/CAM - Engineering Design/Drawings  
CAD/CAM - Forming/Machining/Milling  
CAD/CAM - Grinding  
CAD/CAM - Printed Circuit Board  
CAD/CAM - Sheetmetal  
Ceramics  
Certified Soldering  
Chemical Forming/Machining/Milling  
Class 100,000 Clean Room  
CNC Forming/Machining/Milling  
Coaxial Cable

#### **Fabrication/Repair**

Cutting - Oxyfuel  
Cutting - Plasma  
Cutting - Water Jet  
Electronic ATE  
EPROM/Prom Programming  
Flame Spray  
Forming/Machining/Milling  
Heat Treating  
Hybrid Microcircuit  
Laser Punch  
Metal Finishing  
Optics  
Plating - Anodize  
Plating - Chromium  
Plating - Gold (Brush Plate)  
Plating - Hard Anodize  
Plating - Hard Chrome  
Plating - Nickel

Plating - Silver/Cadmium  
Precision Balancing  
Printed Circuit Board  
Rubber Products  
Test Program Sets  
Tool and Die  
Welding - Arc  
Welding - Certified Ballistic  
Welding - Certified Soldering  
Welding - Plasma  
Welding - TIG, MIG  
Wiring Harness

#### **Test and Inspection**

Air/Fuel Flow  
All Up Round-BIT  
Antenna Test Range



## **Test and Inspection**

Calibration  
Dynamometer - Engine  
Dynamometer - Transmission  
Eddy Current  
Electron Microscope  
Electronic ATE  
Electronic ATE - Analog  
Electronic ATE - Digital  
Electronic ATE - Ditmco  
Electronic ATE - Ditmco 9500  
Electronic ATE - EQUATE  
Electronic ATE - GenRad  
Electrostatic Discharge  
Fiber Optics  
Firing Cycle Measurement System  
Firing Range  
Fluorescent Penetrant  
Fluorescent Penetrant - Automated  
Fluorescent Penetrant - Manual  
Gymnasticator  
Gyro Testing  
Hydraulic Systems  
Hydrostatic  
Laser Measuring  
Load Test  
Magnetic Particle  
NDI Magnetic Particle  
Slopes  
Spectrographic Analysis  
Stress  
Test Tank  
Test Track  
Ultrasonic - Manual  
X-Ray - Film  
X-Ray - Real Time



## **1.4 Red River Army Depot (RRAD), Texarkana, Texas**

### **1.4.1 OVERVIEW**

#### **History/Mission:**

In addition to being the center for repair and maintenance of much of the Army's tracked, armored fleet of combat vehicles, Red River has also established itself as an Innovative leader in the areas of quality, customer service and overall excellence. In 1994 and 1996, the depot was named the best small installation in the continental United States in the Army Communities of Excellence (ACOE) competition. Also the depot was a 1994 finalist and 1995 winner of the President's Quality Improvement Prototype Award. The depot's accomplishments in developing effective union/management partnerships was recognized in February 1996 with one of the first four National Partnership Awards presented by the Vice President.

The recent achievements highlight a history that began on 9 August 1941 when Red River was established as an ordnance depot on land that had been 116 east Texas farms and ranches. Although originally intended to serve only as an ammunition storage depot, Red River's responsibilities soon expanded with the start of World War II to include the maintenance, repair, and overhaul of tanks, artillery pieces, and other heavy weapons. The depot also was assigned a general supply mission in 1943 shipping thousands of tons of ordnance materiel during World War II. RRAD was later assigned the general supply distribution mission in 1949, maintaining that role until the arrival of the Defense Logistics Agency who assumed the responsibility in 1991 and continues today as a tenant organization at Red River.

RRAD also geared up to support U.S. troops in the Korean War, and in 1951 the depot's employment level increased to an all-time high of 11,500. Also in the 1950s the depot retained its prominence in the depot system by pioneering work in logistics. During the Vietnam conflict, the depot responded to increased requirements for maintenance and supply support. Due to its reputation for quality overhaul of combat vehicles, the depot was designated as the rebuild point for the M113 armored personnel carrier family of vehicles in 1977. The mission for repair and overhaul of the Bradley fighting vehicle and the multiple launch rocket system (MLRS) was assigned to the depot in 1980.

Today, Red River continues to have major maintenance and ammunition missions along with the responsibility of certifying and monitoring HAWK and PATRIOT missiles worldwide. The maintenance mission still focuses attention on the repair and overhaul of tracked vehicles, with principal programs centered on the M113, the Bradley, and the MLRS. The ammunition mission is located in a 9,000-acre area on the depot that includes more than 700 storage igloos and 18 magazine buildings. Storage activities include both conventional ammunition and various types of missiles, with a value of more than \$6.3B. The depot's HAWK and PATRIOT mission is conducted by the missile recertification office, which maintains a field office in Germany and sends teams regularly to Army units around the world.

**Location:** RRAD stands at the hub of an area surrounded by the corners of four southwestern states - Arkansas, Oklahoma, Louisiana, and Texas. The depot is located 18 miles west of the joint city of Texarkana, Texas/Arkansas. (Combined population: 75,000.)

**Size:** RRAD occupies 19,081 acres, of which 208 acres are devoted to the maintenance mission. There are 1,400 buildings on the installation, with 86 devoted to maintenance operations. Maintenance facilities consist of 825,094 SF out of the facility's total of approximately 8,000,000 SF. Total value of the maintenance facility is approximately \$160M and plant equipment value is \$140M.

**Workforce/Payroll:** Military personnel, 11, civilian personnel, 2,650. Annual payroll, more than \$110M.

**Transportation Access:** RRAD is supported by one airport, multiple rail and motor freight carriers to include 23 regular route common carriers and 13 specialized commodity carriers, and one east-west interstate highway (I-30).

#### **Environmental Conditions/Constraints:**

- **Air Quality Management:**

RRAD has several permits from the Texas Natural Resource Conservation Commission (TNRCC) covering a gamut of air emission sources, such as degreasing, plating, abrasive cleaning, coal/wood fired boilers, fluidized bed, rubber denuder, open burning/open detonation of explosives and propellants, and tire rebuilding. RRAD is located in Air Quality Region 22 that includes Shreveport, Texarkana, and Tyler. The air quality in AQCR 22 is classified as attainment for all criteria pollutants.

- **Water/Wastewater Management:**

RRAD submitted a notice of intent to be covered under the storm water general permit for storm water management. A storm water pollution prevention plan is in place and best management practices identified in the plan are being complied with. The first annual compliance evaluations, as required under general permit coverage, are underway at this time.

- **Hazardous and Solid Waste Management:**

RRAD has reduced disposal costs and liabilities associated with off-site disposal by implementation of a stabilization/fixation process for heavy metal contaminated waste such as blast media garnet, steel shot, walnut hull, plastic beads, steam bay sludge, soils, absorbents, power washer waste and chemical vat waste. This process allows the blast media to be deposited in the on-site Class II landfill. RRAD treats approximately 2 million pounds of heavy metal contaminated waste annually and has realized a savings in per pound disposal costs of \$0.675. During the last year RRAD treated 2,620,022 pounds for a total cost of \$327,502.76 resulting in a savings of \$1,766,515.15.

Hazardous waste minimization efforts have been implemented at RRAD's industrial facility, including an improved metal finishing process, a decontamination process for the ducts in the electroplating shop, and a pH adjustment process for spent electroplating and cleaning baths. The improved metal finishing process eliminates the use of a final rinse that contains chromium and substitutes a rinse that is chromium free. This has resulted in a class change for the waste generated by this process. It is now classified as non-hazardous.

RRAD closed a Type I sanitary landfill on October 8, 1993. In August 1994 a new landfill was opened that meets the Subtitle "D" standard, double liner with a leachate collection system. The life expectancy is 20 - 25 years and offers the maximum protection to groundwater possible. The landfill serves both RRAD and Lone Star Ammunition Plant and is operated by LSAP.

An automated tracking system, developed in-house by environmental and systems analyst personnel, allows RRAD to track hazardous waste from "cradle to grave" as required by law. The automated system has been in place since August 1990 and has helped in maintaining compliance during regulatory inspections. This tracking system has been fielded throughout the command at different installations and was as a model by the Army Materiel Command for the development of a command wide system. In addition to maintaining compliance, the system allows environmental workers to schedule work to better serve the depot and its customers.

- **Environmental Summary:**

In August 1988, the depot was issued a ten year RCRA Hazardous Waste Permit by both the Texas Natural Resource Conservation Commission (TNRCC), formerly Texas Water Commission (TWC), and the Environmental Protection Agency (EPA). In November 1988 RRAD submitted a "Part B" application for open burning/open detonation of waste explosives, in miscellaneous units (Subpart X) to both agencies. Under EPA oversight, the state agency received approval authority for "Subpart X" applications, as well as "Part A" and "Part B" applications. During the first and second quarter of FY94, RRAD updated "Subpart X," "Part A" and "Part B" applications. This updated package is presently being reviewed by TNRCC and approval is expected in 1995. RRAD continues to operate the open burning/open detonation activity under interim status.

RRAD environmental staff periodically provides reports and certification to TNRCC and EPA as required. The RRAD environmental office has developed a good working relationship with both of these regulatory agencies. With the passing of the Federal Facilities Compliance Act, the annual multimedia inspections have become more comprehensive in nature.

RRAD has maintained a high level of compliance, and has been issued very few major notices of violations.

#### **1.4.2 PLANNED TECHNOLOGICAL ENHANCEMENTS**

A proposal to expand RRAD's recycling efforts to include a paper pelletizer facility is in process. Pelletized paper would be utilized as boiler fuel. Used wooden pallets are already being recycled in this way, and represent approximately 20 percent of the total boiler fuel used at RRAD annually. The utilization of pelletized paper for boiler fuel would reduce the use of coal by an additional 10 percent.

##### **Manufacturing Techniques/Processes:**

In FY93 the Base Closure and Realignment Commission recommended the realignment of Tooele Army Depot. Red River Army Depot is currently modifying existing processes to accommodate the additional "core" workload transferring from TEAD. RRAD is currently planning the following systems:

- M9 armored combat earthmover
- Reverse osmosis water purification systems (ROWPU)
- ROWPU power units
- Heavy equipment transport system, truck and trailer
- Pallet loading system components

For several years RRAD has been postured as the light combat vehicle Center of Technical Excellence (CTX) and depot maintenance facility for the Army. Included are armored personnel carriers, assault vehicles, air defense weapon systems carriers, land combat missile system platforms (where system integration requirements demand repair/overhaul of the platforms at RRAD), and light tracked anti-tank and communications station carriers. Inherent in the repair/modification for assigned systems is the associated repair of engines and other secondary items.

Capability in the light truck area has been established for many years and RRAD has constantly been in pursuit of the latest technological advancements to upgrade and maintain the current level of support. The modification of existing processes to accommodate "core" workload items identified above will make the depot even more versatile.

- **Bias and Radial Tire Rebuild:**

Pursuant to BRAC 93 guidance and direction from the Commanding General of DESCOM the tire rebuild mission that was located at TEAD has been transferred to RRAD. The bias ply tire equipment

has been installed and is operational. The radial tire equipment was installed by years end, 1996. RRAD has the only organic tire rebuild capability within the Army.

- **Fluidized Bed Denuding System:**

RRAD has the only CONUS road wheel and track rebuild facility operated by DOD. RRAD supports the road wheel and track block requirements for all of DOD, not just the Army. RRAD production engineering division and rubber product division personnel have developed and initiated a production improvement and modernization program. This five-year modernization program addresses work place safety, environmental improvements, quality improvements, increased productivity, and cost reductions. The modernization program includes installation of a fluidized bed rubber denuding system to strip rubber from metal parts and the replacement of compression molding systems with state-of-the-art injection molding equipment.

The fluidized bed system (FBS) represents an investment of over \$3M. USAMC and DESCOM provided guidance and support after evaluating the FBS as environmentally necessary, technically feasible and economically justified.

FBS rubber removal, or denuding, is a process in which road wheels or track blocks are submerged in a fluidized bed heating tank at an appropriate temperature, and for an appropriate time period, to totally pyrolyze the rubber material. To pyrolyze means all organic components of the rubber are converted to gases, which are then removed and burned in a secondary combustion chamber. The air stream is cleaned before being exhausted to the atmosphere. After rubber removal is complete, the road wheels or track metal parts are transported to a water quench tank for cooling and then to an unloading station. The hot FBS tanks are totally enclosed with the operators remotely located in a control room. The heating, cooling, ventilation/pollution control, and material handling systems are all automated and computer controlled.

The FBS system of denuding is in production and is a major factor in achieving the rubber products modernization program objectives that include a 10 percent reduction in hazardous waste, a 29 percent reduction in volatile organic compounds emitted to the atmosphere, and a 38 percent reduction in utility costs. This system will enable RRAD to reach the highest competitive level in road wheel and track remanufacturing with the capability to rebuild all configurations of road wheels and track in quantities required to support all DOD activities.

The injection-molding portion of the program is in process of implementation with one machine installed for the production of track shoe pads and the remainder is in the process of being accepted at the factory. This system has integral automatic data capture and storage for statistical process control that will improve product quality.

- **Metal Finishing Facility:**

RRAD is currently upgrading the metal finishing capabilities in the Maintenance Directorate. A new metal finishing facility is planned. The project consists of construction of a new metal finishing facility that will consolidate anodizing, electroplating, and painting operations for component parts at one location. The facility will utilize state-of-the-art reclamation and point source treatment for chemicals. Ventilation and emission control equipment will meet all federal and state regulations. The facility will process aluminum armor, steel, steel armor, stainless steel, and magnesium parts. Workload will include armament, engine, transmission, and vehicle components. The facility will include state-of-the-art cleaning, plating, and coating equipment providing best available technology (BAT) and best available pollution control technology (BAPCT). Capability to meet current future workloads as well as compliance with new and projected environmental regulations will be provided. Estimated cost of installed equipment over and above that furnished, as a part of the building is \$10 million.

- **Machine/Tools:**

A process action team (PAT) studied the machine/tools capabilities in the maintenance directorate and developed a plan to modernize two of the machine shops located in the directorate. Seven additional pieces of NC/CNC equipment were installed in FY94 with five more in the procurement process. The depot already has a wide range of capability available to support vehicle production and fabrication programs. When the additional equipment is on line, its capability and efficiency will be one of the best in the Depot System Command.

- **Computer Aided Design/Computer Aided Manufacturing:**

A new CAD/CAM system has been purchased. The replacement CAD/CAM system at RRAD is a state-of-the-art system with main file server, scan/analysis workstation, print/plot workstation, ten design workstations, and four NC workstations. The new system increases the efficiency in preparing engineering designs and NC file preparation in support of the RRAD maintenance mission. All components were installed year ending 1994.

- **Coordinate Measuring System:**

RRAD has purchased a computer-aided coordinate measuring system to determine critical hull measurements to be used during conversion programs on light track vehicles. Up to six theodolites are available for use in the system. The system will also support prototype development and other program developments under way and planned by RRAD.



- **Materiel Handling/Storage:**

An automated materiel handling and storage upgrade was completed in August 1994. The \$7,880,000 project provided an upgrade to an existing 1971 vintage storage retrieval system located in the maintenance directorate. The project consisted of the replacement of existing storage retrieval machines and storage racks. It includes the addition of an automated editing workstation, an automated delivery system, and the installation of pallet elevators in two buildings.

The benefits of the new system include a reduction in the cost to distribute material between the ASRS and the vehicle assembly lines, and a reduction in the cost to build and transport material kits to the production lines.

- **Environmental Considerations:**

Red River is in the process of expanding capabilities in the environmental area for the analysis of hazardous waste. One of the primary analyses done in this regard is the toxic characteristic leachate procedure (TCLP). This procedure produces an extract simulating that which would be produced by exposure of this waste to acid rain over its lifetime in a landfill contaminating groundwater. This extract is then analyzed for a wide variety of different chemical contaminants.

Instrumentation to accomplish this and other necessary hazardous waste analysis was awarded in August 1994, with development of fully functional operations during 1995. Implementation of this program provides significant benefits to include:

Verifiable operational cost savings through the performance of mandatory hazardous waste testing in-house versus off-site.

A routine "turn-around" time for result receipt, which is much quicker than available with utilization of off-site laboratories.

More accurate assessments due to involvement of depot chemists with a vast body of knowledge and expertise accumulated through years of involvement with depot resident chemical processes.

Improved logistics (i.e., no more costly shipping of hazardous material to off-site laboratories) and quicker response to emergency situations.

A greater control over both quality and liability (criminal and financial).

Closer coordination with environmental administrators, greater understanding of needs, improved interpretation of results, less waste and most importantly, fewer errors.

Increased avoidance of and quicker fixes to non-compliance situations.

All these factors contribute to an improvement in RRAD's ability to perform environmental duties with a severely lessened probability of costly and/or tragic consequences due to incomplete, inaccurate, misinterpreted or untimely analytical results. There is a potential for cost savings that goes beyond routine operational savings.

Development of these on-site analytical services enables RRAD to provide the most efficient management of hazardous materials and is the safest and surest way to discharge critical environmental obligations in this regard.

This provides a significant advantage over installations without this capability, as the cost of doing business in meeting environmental obligations is a major expenditure, which can be expected to steadily increase.

Current operations of the laboratory are such that outside audits have deemed the management of the laboratory itself, in relation to such things as hazard minimization and employee protection is exemplary and should be used as a model for similar Department of Army operations.

#### **Significant Existing/Current Capabilities:**

Red River maintains on-site, two well equipped, specially designed state-of-the-art laboratory facilities comprising over 3,700 square feet. These facilities house process control, oil analysis, environmental monitoring and radiation testing laboratories.

All processes involving chemical use are monitored through laboratory analysis on a recurring basis to maintain the highest quality product. Shelf life testing, process improvement, and waste reduction programs are all emphasized in this effort. Some of the analytical work conducted in this area has been shared for applications at other installations within the Army and DOD, as well as within the private sector (i.e., defense industries building service vehicles).

The depot has a dedicated laboratory, which implements the Army's oil analysis program (AOAP). This is a proven effective tool for evaluating the conditions of oil wetted components and predicting premature wear and failure occurrences. Institution of this program has resulted in a significant percentage decrease in defective components reaching customers. Red River has four certified evaluators on staff and has a well-earned reputation for excellence in this field.

The product assurance laboratory also provides the analytical services mandated by the depot's national pollutant discharge elimination system (NPDES) permits to ensure regulatory compliance and the protection of our natural resources. The laboratory maintains an extensive statistical process control (SPC) program and has an excellent record on performance evaluations conducted by the Environmental Protection Agency (EPA) and the Texas Natural Resource Conservation Commission (TNRCC).

The laboratory also provides base support in such areas as lead abatement, drinking water analysis and industrial hygiene surveys.

Red River has also designed and built a state-of-the-art radiation-testing laboratory incorporating some innovative designs particularly in the area of exhaust stack monitoring. This laboratory is unparalleled among AMC installations for its ability to prove compliance with the Nuclear Regulatory Commission's (NRC) limit on release of tritium to the atmosphere. The safeguards and technology installed within this laboratory easily provide for potential expansion to accommodate larger and more hazardous workloads.

At present Red River's laboratories support not only the installation, but also provide necessary support to tenants such as the U.S. Army Health Clinic and the Defense Logistics Agency (DLA) as well as our satellite, Camp Stanley Storage Activity in San Antonio, Texas.

### **1.4.3 COMMODITIES AND PRODUCTS**

#### **Aircraft**

Accessories and Components  
Armament  
General Purpose  
Support Equipment

#### **Automotive Equipment**

Accessories and Components  
Armament  
Communications  
Electronics  
Engine  
Fire Control

#### **Automotive Equipment**

Hull & Chassis  
Support Equipment

#### **Combat Vehicles**

Accessories and Components  
Armament  
Communications  
Fire Control

#### **Combat Vehicles**

Hull & Chassis  
Power Plants  
Support Equipment  
General Purpose

#### **Communications/Electronic**

Accessories and Components  
Electronics  
General Purpose  
Power Plants GTE  
Power Plants Recip  
Radar

#### **Communications/Electronics**

Shelter/Housing  
Support Equipment

#### **Missile**

Accessories and Components  
GTE Propulsion  
Guidance System  
Missile Frame  
Payload System  
Solid Propulsion  
Support & Launch  
Surface Command & Control

## **Ordnance**

Accessories and Components  
Chemical & Bacteriological Weapons  
Conventional Arms & Explosives  
Engines  
Guns & Artillery  
Small Arms

### **1.4.4 PROCESSES AND TECHNOLOGIES**

#### **Cleaning/Stripping**

Abrasive Flow  
Agricultural Media Blast  
Flash Lamp  
Fluidized Bed  
Glass Media Blast  
Grit Blast  
Hazardous Chemicals  
Non-Hazardous Chemicals  
Sand Blast  
Steam  
Steel Media Blast  
Ultrasonic  
Vapor Degreaser  
Vibratory Finishing

#### **Fabrication/Repair**

Electronic ATE  
EPROM/Prom Programming  
Flame Spray  
Forming/Machining/Milling  
Foundry - Non-ferrous  
Heat Treating  
Metal Finishing  
Metrological  
Optics  
Phosandodize

#### **Fabrication/Repair**

Air Conditioning - Freon  
Autoclave Large  
CAD/CAM - Artwork-Flat Wire Cables  
CAD/CAM - Artwork-Printed Circuit Board  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Drilling/Lathe/Punch  
CAD/CAM - Engineering Analysis  
CAD/CAM - Engineering Design/Drawings  
CAD/CAM - Forming/Machining/Milling  
CAD/CAM - Printed Circuit Board  
CAD/CAM - Sheetmetal  
Ceramics  
Certified Soldering  
Class 100,000 Clean Room  
CNC Forming/Machining/Milling  
Coaxial Cable  
Cutting - Oxyfuel  
Cutting - Plasma

#### **Test and Inspection**

Electronic ATE - Equate  
Electronic ATE - GenRad  
Electronic ATE - STE-FVS  
Electrostatic Discharge  
Firing Range  
Fluorescent Penetrant - Manual  
Hydraulic Systems  
Hydrostatic  
Laser Measuring  
Liquid Penetrant - Manual

**Fabrication/Repair**

Plating - Cadmium  
Plating - Chromium  
Plating - Hard Anodize  
Plating - Hard Chrome  
Plating - Nickel  
Plating - Silver/Cadmium  
Plating - Tin/Lead  
Printed Circuit Board  
Robotic CARC Painting  
Robotic Metal Spray  
Robotic Painting  
Rubber Products  
Test Program Sets  
Tool and Die  
Welding - Arc  
Welding - Certified Ballistic  
Welding - Dabber TIG  
Welding - Plasma  
Welding - TIG, MIG  
Wiring Harness

**Test and Inspection**

Air/Fuel Flow  
All Up Round-BIT  
Bearing Process  
Calibration  
Dynamometer - Engine  
Dynamometer - Transmission  
Electronic ATE - Analog  
Electronic ATE - Digital  
Electronic ATE - Ditmco

**Test and Inspection**

Liquid Penetrant - Manual  
Magnetic Particle  
NDI Magnetic Particle  
Radiography - Gamma  
Slopes  
Spectrographic Analysis  
Stress  
Test Slopes  
Test Tank  
Test Track  
Ultrasonic - Manual  
Video Inspection Probe  
X-Ray - Film



## **1.5 Tobyhanna Army Depot (TYAD), Tobyhanna, Pennsylvania**

### **1.5.1 OVERVIEW**

#### **History:**

- The Army's presence dates to 1912 with the creation of the Tobyhanna Military Reservation as a Regular Army and National Guard field artillery training site.
- During World War I, activities at the installation expanded to include ambulance and tank training center. Between the wars, the National Guard used the camp as a field artillery training camp. During the 1930s, the reservation housed a Civilian Conservation Corps facility and also a camp for homeless men.
- In the summers between 1938 through 1941, West Point cadets used the facility for field artillery training.
- During World War II, Tobyhanna was used as an Army Air Corps training center, storage point for gliders used in the D-Day Landings at Normandy, and as a prisoner-of-war camp for more than 200 German enlisted personnel. A 125-bed hospital was built here near the end of the war, but was never fully utilized.
- At the end of the war, the entire reservation, more than 20,000 acres was transferred to the Commonwealth of Pennsylvania for conservation and recreation purposes.
- By 1950, the Army Signal Corps was forced to vacate a rented facility in Baltimore, Maryland. The Army was determined to build a permanent Signal Depot on the East Coast, near ports and electronics manufacturers. In 1951, the Army reacquired a 1,400-acre portion of the former military reservation and announced plans to build a \$35 million Signal Corps Depot.
- 01 February 1953, Tobyhanna Signal Depot officially opened.
- In 1962, an Army-wide reorganization resulted in a name change to Tobyhanna Army Depot.
- Due to the Vietnam War, the depot's workload doubled between 1964 and 1968, and the work force strength topped 4,000 in 1967.
- In 1977, the depot's environmental efforts were recognized with the Army Chief of Staff's Natural Resources Conservation Award, the first of numerous environmental awards the depot would earn at Army and Defense Department levels.
- In 1982, the depot dedicated the Communications-Electronics Production Facility, commencing a 15-year construction and modernization program that would add several new buildings and facilities to support the depot's expanding missions.
- In 1988, the first Base Closure and Realignment Commission (BRAC) recommended the transfer of workload from Lexington-Blue Grass Army Depot, Kentucky, to Tobyhanna.
- In 1991, Tobyhanna gained workload following the BRAC-directed closure of Sacramento Army Depot.
- The 1995, BRAC closed the Air Force's Sacramento Air Logistics Center and transferred its ground communication-electronics maintenance mission to Tobyhanna. In 1997, the Defense Depot Maintenance Council approved a three-year transition of that workload beginning in Fiscal Year 1998. The 1995 commission also directed the transfer of missile guidance and

control workload from Letterkenny Army Depot "to Tobyhanna or the private sector." In 1998, the Army directed that this workload move to Tobyhanna in 2001.

- In 1997, Operational Control of TYAD was given to Commanding General, Communications-Electronics Command (CECOM)

**Mission:**

- Tobyhanna Army Depot provides depot level maintenance support for ground, airborne, navigational, and satellite communications-electronics equipment (GCE) and missile systems. TYAD provides worldwide maintenance support (on-site) for all assigned commodities through technical assistance teams, Forward Repair Activities, and Field Service Representatives.
- All of the organizations are integral members of a highly motivated team that meets the challenges of changing technology and special mission requirements. Mission functions are in support of the Army, other military services, other federal government agencies and friendly foreign nations.
- The depot is the largest communications-electronics fabrication/overhaul facility in the Department of Defense (DOD). Its mission includes overhaul, rebuild, modification, conversion, repair, manufacturing and fabrication of assigned commodities; "quick reaction" fabrication support for the U.S. Armed Forces and other government agencies; and operation of an automatic test and diagnostic equipment programming facility. TYAD also provides project design and development service for Special Fabrication Projects (SFPs), including procurement data packages. Serves as the Center of Technical Excellence (CTX) for designated new or product improved systems and subsystems. The depot possesses an antenna pattern range, which supports the Army, Navy, Air Force, and Marine Corps radar requirements. Additional ranges and facilities are now being added to accommodate Air Force GCE and missile workload.
- As part of its mission, the depot also procures transportation and provides storage and related services for movement of DOD household goods of military and civilian personnel in designated areas of Pennsylvania and New Jersey, conducts training for military personnel, and provides support maintenance to satellite organizations and tenant activities.
- The depot also has a reserve training center, one of two in the Army, designated as high tech regional training sites/maintenance. Supervises training of assigned units. Provides logistical support and training assistance for U.S. Army Reserve and National Guard Units. The depot operates a permanent secure 160,000 SF building to repair, package, ship and store COMSEC material.

**TYAD's assigned commodities are:**

Electronic and Communication Equipment and Components  
General Equipment and Components  
Commodity Groups and Components  
Combat Vehicles (Electronic-Communication Equipment only)



Missile Systems and Components (Electronic-Communication Equipment only)  
Aircraft Components (Electronic-Communication Equipment only)

**Location:**

- Government owned and operated facility located in Coolbaugh Township, Monroe County, Pennsylvania.
- The depot is in the heart of the Pocono Mountain resort area.
- Approximately 90 miles west of New York City, 100 miles north of Philadelphia, 22 miles south of the city of Scranton, 15 miles northwest of Stroudsburg, and 5 miles north of the borough of Mount Pocono.

**Size:**

- Installation occupies a total of 1,293 acres, of which 398 acres are within a fenced secure industrial area.
- 255 total facilities.
- 137 buildings and 118 structures.
- Estimated replacement value of \$655M.
- \$150.5M of industrial machinery and equipment.

**Workforce/Payroll:**

- The total installation work force at the close of FY98 numbered in excess of 3,100 personnel. 2,560 assigned to TYAD.
- Primarily a Department of the Army civilian work force with a small cadre of assigned military personnel.
- Payroll for FY98 was over \$125M.

**Transportation Access:**

- Several regional and national trucking companies provide long haul services around the clock.
- Immediate access to Interstates 80, 81, 84, 380 and the Pennsylvania Turnpike.
- Military airlift facilities available
- McGuire AFB, New Jersey (125 miles)
- Dover AFB, Delaware (180 miles)
- Commercial Airports:
  - Wilkes-Barre/Scranton and Allentown-Bethlehem-Easton airports accommodate the largest military and commercial aircraft. Located 22 and 50 miles, respectively.
  - Mount Pocono Airport accommodates a variety of fixed- and rotary-wing Army aircraft.
  - Water transportation for heavy freight shipments overseas is available within 120 miles at the Military Ocean Terminal, Bayonne, New Jersey. Additionally, the depot is within close proximity to the commercial ports of New York City, Philadelphia, and Baltimore.

**Environmental Program:**

- Hazardous Material (HM) Management System is being implemented to automate the distribution of HM through pharmacies and reduce disposal costs.
- Main water management actions include protection of drinking water well heads, denitrification treatment and ultraviolet treatment at the sewage treatment plant.
- Main air management initiatives include obtaining air permits for the new Industrial Operations Facility, Title V air permit approval, and conversion from central coal fired boilers to a decentralized natural gas system.
- Continues to exceed DOD recycling goals.
- Conducts 20 different types of inspections weekly, monthly, or quarterly.
- Trains over 800 employees annually in 21 regulatory courses.
- Conducts quarterly spill exercises and has mutual response agreements with local spill responder organizations.
- Facilities Environmental Management System has over 5,200 monitoring points, twelve systems/processes monitored, and 7 pollution prevention projects.
- ISO 14001 implementation includes GAP analysis, draft of the Environmental Management System manual, coordinating environmental impacts and analysis of business actions.

**1.5.2. TECHNOLOGICAL ENHANCEMENTS****Manufacturing Techniques/Processes:**

- Prime site for the flexible computer integrated manufacturing (FCIM) program featuring a state-of-the-art circuit board manufacturing facility to provide spare parts.
- Integration of equipment, software, communication, human resources, and business practices within an enterprise
- Rapidly manufactures, repairs, and delivers items on demand with continuous improvements in the processes.
- Goal of the FCIM program is a cycle time of 30 days from identification of the field requirements to delivery of the manufactured part to the field.
- Affiliated with the Commonwealth of Pennsylvania Department of Commerce Program designated the Ben Franklin Partnership.
- Fosters cooperative projects between industry and universities to improve productivity through application of modern technology.
- Hi-tech projects identified by the depot that are joint ventures with the partnership include surface mount testing and repair, applications for composite materials, artificial intelligence, and reverse engineering to avoid sole source contracting.
- Application of any of these proposed projects using the latest state-of-the-art equipment, materials, and procedures will increase the efficiency and effectiveness of the depot.

- Three anechoic test chambers that provide highly controlled, precise environments for testing antennas will be installed at Tobyhanna.
- Indoor ranges, compact or near-field, prevent weather elements such as snow, ice, rain, or temperature fluctuations from interfering with the process of testing antennas.
- Physical area required for testing is greatly reduced with these chambers as opposed to using an outdoors far-field test range.
- Radio Frequency interference is also eliminated by the utilization of a specially designed sealed skin.

#### **Repair Techniques/Processes/Facilities:**

- Capability to heat treat various grades of aluminum, including 2024, 6061, and 7075 utilizing an automated heat treating, quick quench drop bottom furnace system.
- Allow our industrial support shops to form untempered aluminum components.
- Heat-treat them to their maximum temper, thereby increasing productivity and performance.
- Ion vapor deposition (IVD) process will allow our plating shop to produce high purity aluminum coatings on various base metals, including high strength steel and titanium.
- Substitution with IVD aluminum provides acceptable or improved performance in many applications when compared to cadmium plating (which it replaces).
- The IVD process is environmentally friendly and produces no hazardous waste. After the parts are coated, they are chromate treated to provide additional corrosion protection and a good base for paint adhesion.

#### **Depot Modernization Plan:**

##### **Industrial Operations Facility:**

- 91,000 square feet industrial shops facility
- Permanent enclosure scheduled for FY99.
- Provide a centralized area for the sandblast, ultrasonic cleaning, plating, and paint and photofabrication of CE component parts.
- Multi-million dollar industrial complex is 98% complete.
- Active participant in the Facility Reduction Program (FRP) supporting government's initiative to reduce real estate (land and buildings) operating costs.

### 1.5.3 COMMODITIES AND PRODUCTS

#### **Aircraft**

- Accessories and Components
- Armament
- Avionics
- Engines
- General Purpose
- Metal Airframe
- Non-Metal Airframe
- Support Equipment

#### **Automotive Equipment**

- Accessories and Components
- Armament
- Communications
- Electronics
- Engine
- Fire Control
- Hull & Chassis
- Support Equipment

#### **Communications/Electronics**

- Accessories and Components
- Electronics
- General Purpose
- Power Plants GTE
- Power Plants Recip
- Radar
- Shelter/Housing
- Support Equipment

#### **General Support Equipment**

- Accessories and Components
- Electronic Test Equipment
- Heating & Air Conditioning
- Machine Tools
- Power Plant/Generator Set GTE
- Power Plant/Generator Set Recip
- Rail Equipment - Locomotives

#### **Combat Vehicles**

- Accessories and Components
- Armament
- Communications
- Fire Control
- General Purpose
- Hull & Chassis
- Power Plants
- Support Equipment

#### **Construction Equipment**

- Accessories and Components
- Communications
- Electronics
- Engine
- Hull & Chassis

#### **Ordnance**

- Accessories and Components
- Chemical & Bacteriological Weapons
- Conventional Arms & Explosives
- Engines
- Guns & Artillery
- Small Arms

#### **Ships**

- Communications & Electronics

#### **General Support Equipment**

- Rail Equipment - Rolling Stock
- Topographic
- Troop Support Equipment

## **Missile**

Accessories and Components  
GTE Propulsion  
Guidance System  
Missile Frame  
Payload System  
Solid Propulsion  
Support & Launch  
Surface Command & Control

### **1.5.4 PROCESSES AND TECHNOLOGIES**

#### **Cleaning/Stripping**

Agricultural Media Blast  
Alum Oxide  
Bake Oven  
Citric Acid  
Glass Media Blast  
Grit Blast  
Hazardous Chemicals  
High Pressure Water Washing  
Micro Blast  
Non-Hazardous Chemicals  
Photo Etching  
Plastic Media Blast  
Sand Blast  
Steam  
Steel Media Blast  
Ultrasonic  
Vapor Degreaser  
Vibratory Finishing  
Water Jet

#### **Fabrication/Repair**

Air Conditioning Freon  
CAD/CAM - Artwork-Flat Wire Cables  
CAD/CAM - Artwork-Printed Circuit Board  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Drilling/Lathe/Punch  
CAD/CAM - Entering Analysis  
CAD/CAM - Entering Design/Drawings  
CAD/CAM - Engineering Analysis

#### **Fabrication/Repair**

CAD/CAM - Engineering Design/Drawings  
CAD/CAM - Forming/Machining/Milling  
CAD/CAM - Grinding  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Printed Circuit Board  
CAD/CAM - Sheetmetal  
CAD/CAM - Vertical Internal Grinder  
Certified Soldering  
Chemical Forming/Machining/Milling  
Class 100,000 Clean Room  
CNC & NC Programming  
CNC Forming/Machining/Milling  
Coaxial Cable  
Cryptographic  
Cutting - Laser  
Cutting - Oxyfuel  
Cutting - Plasma  
Cutting - Water  
Cutting -Water Jet  
Electrical Systems

Electronic ATE  
EProm/Prom Programming  
Fiber Optics  
Flexible Machining Cell  
Forming/Machining/Milling  
Hart Anodizing Sulfuric Acid  
Heat Treating  
Metal Finishing  
Metrological  
Phosandodize

**Fabrication/Repair**

Photo Etching  
Plastic Injection  
Plating - Anodize  
Plating - Cadmium  
Plating - Chromium  
Plating - Copper  
Plating - Electro  
Plating - Electroless Nickel  
Plating - Gold (Brush Plate)  
Plating - Gold/Silver  
Plating - Nickel  
Plating - Tin/Lead  
Precision Balancing  
Printed Circuit Board  
Rubber Products  
Sand Blast  
Test Program Sets  
Tool and Die  
Welding - Arc  
Welding - TIG, MIG  
Welding -Arc  
Wiring Harness

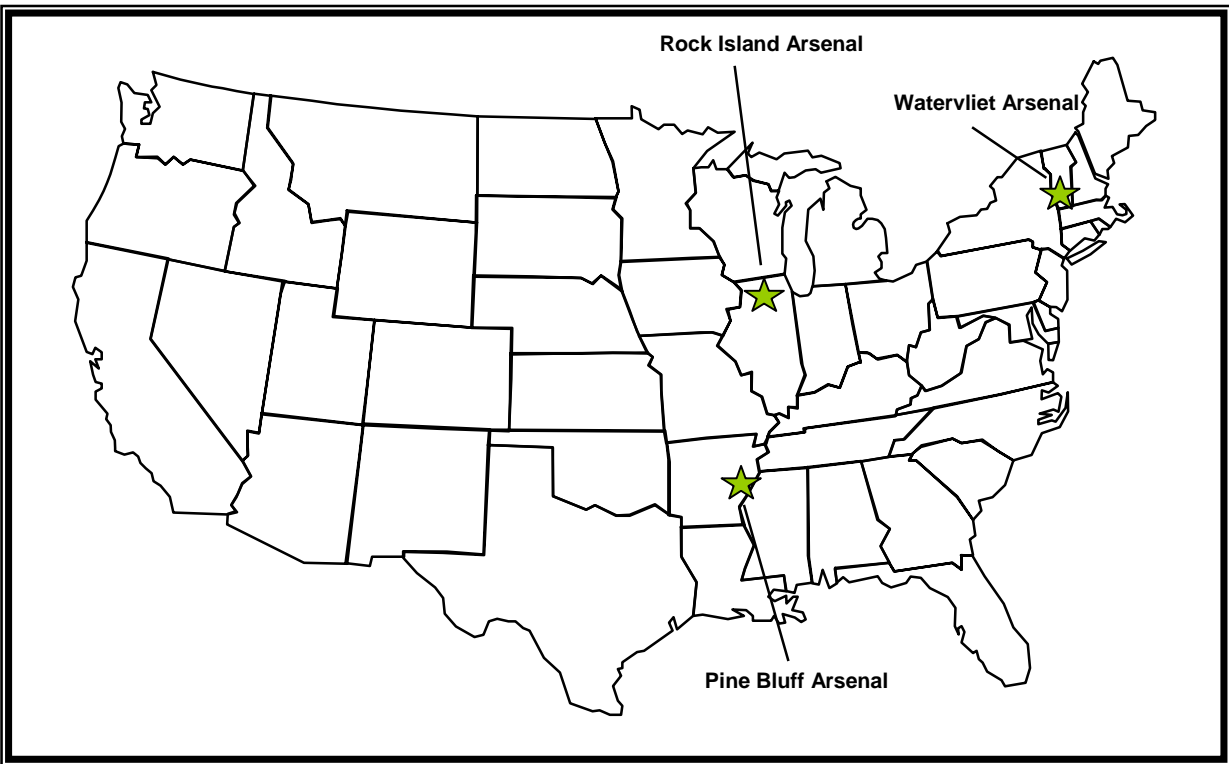
**Test and Inspection**

Antenna Test Range  
Bonding test  
Calibration  
Electronic ATE  
Electronic ATE - Analog  
Electronic ATE - Digital  
Electronic ATE - Ditmco  
Electronic ATE - EQUATE  
Electronic ATE - GenRad  
Electrostatic Discharge  
Environmental Vibration  
Fiber Optics  
Fluorescent Penetrant - Manual  
Gyro Testing  
Magnetic Particle  
NDI Magnetic Particle  
Spectrographic Analysis

**Test and Inspection**

Stress  
Tempest Test  
Ultrasonic - Manual  
X-Ray - Film  
X-Ray - Real Time

## Army Arsenals



### 1.6 ARMY ARSENALS

The Army Arsenals report to the US Army Industrial Operations Command (IOC), located at Rock Island Arsenal, Rock Island, Illinois, a major subordinate command of the US Army Materiel Command. The three arsenals are; Pine Bluff, Rock Island, and Watervliet, and are shown on the map above. Pine Bluff Arsenal does not have a depot level repair function, therefore will not be shown in the capability matrix portion of this document.





## **1.7 Pine Bluff Arsenal (PBA), Pine Bluff, Arkansas**

### **1.7.1 OVERVIEW**

#### **History:**

- Originally established in 1941 to load incendiary bombs and expanded during World War II to manufacture, load and store gases; and fill smoke and white phosphorus munitions.
- A biological weapons mission was added in 1953 and continued until 1969.
- Selected as the sole site for the Binary Production Facility in 1978, the program was active until 1990. A unique project for disposal of obsolete agent BZ was initiated in 1980 and spanned a decade.
- PBA remains the second largest stateside storage site for the nations chemical stockpile; scheduled to be destroyed over the next few years.
- Today, PBA is the nation's only active chemical arsenal.

#### **Mission:**

- PBA plays a role in the Army Force Integration Process and has direct involvement in various phases of the Life Cycle Systems Management Model: from Phase 2 – Engineering and Manufacturing Development, through Phase 3 – Production and Deployment, and Phase 4 – Operation and Support.
- PBA supports design agencies with development and engineering, prototype production, testing and demonstration.
- PBA serves as the Group Technology Center for illuminating and infrared munitions, serves as the Specified Mission Facility for smoke munitions and maintains the sole U.S. capability for white phosphorus fill.
- PBA is the Joint Services' Center of Expertise for Chemical-Biological Defensive Equipment production, maintenance, testing, certification and training.
- PBA produces, stores, and demilitarizes conventional ammunition.
- PBA supports the storage and destruction of the second largest stateside chemical weapons stockpile, preservation of the only permitted site east of the Rockies for acceptance of non-stockpile chemical munitions; and enforcement of international treaty efforts through compliance and education of worldwide inspectors.
- PBA ensures environmental excellence through hazardous material/waste management programs; and serves the needs of Arkansas communities and the military population as the only active Army installation in the state.

#### **Location:**

- PBA, located in Southeast Arkansas, is 35 miles Southeast of Little Rock and eight miles Northwest of the City of Pine Bluff.

**Size:**

- PBA is 8 1/2 miles long by 2 3/4 miles wide and covers 14,943 acres.
- 947 buildings and structures covering 3.5 million square feet of floor space.

**Workforce/Payroll:**

This information is considered procurement sensitive data during our A-76 Study process.

**Transportation Access:**

- PBA is bordered on the East by the McClellan-Kerr Arkansas River Navigation System and on the West by the Union Pacific Railroad and U.S. Highway 65, making it directly accessible by rail, road, or waterway.
- PBA is located 35 miles south of the Little Rock National Airport, and 40 miles from Little Rock Air Force Base. In addition, Arkansas is one of the Nation's leaders in trucking activities.

**Environmental Programs:**

- PBA, recipient of the DOD Environmental Quality Award for Excellence, continues to be a leader in the environmental management field.
- The Arsenal's treatment, storage, and disposal facilities possess a broad range of capabilities to support current and future production, testing, and demilitarization. All operations are fully permitted and in compliance with state and federal environmental regulations in air, water, solid waste, toxic substance, and hazardous waste.
- PBA's Natural Resources Program has been recognized as one of the best in the in the Army four years in a row by the Renew America Program and has achieved great success through creative partnerships with the Arkansas Heritage Commission, The Nature conservancy, Three Rivers Audubon Society, Arkansas Game and Fish Commission and the U.S. Fish and Wildlife Service.

**1.7.2 PLANNED TECHNOLOGICAL ENHANCEMENTS**

This information is considered procurement sensitive data during our A-76 study process.

**1.7.3 SIGNIFICANT EXISTING/CURRENT CAPABILITIES**

This information is considered procurement sensitive data during our A-76 study process.

## **1.8 Rock Island Arsenal (RIA), Rock Island, Illinois**

### **1.8.1 OVERVIEW**

#### **History:**

- The Rock Island Arsenal property has been owned and operated by the government since the United States acquired title to the land in 1804 through a treaty with the Sac and Mesquakie Indians.
- The U.S. Army established a significant military presence on the island with the building of Fort Armstrong in 1816. Rock Island Arsenal was established by an act of congress in July 1862.
- Construction of the first manufacturing buildings began in 1866 and continued until the last Stone Shop was completed in 1893. In 1884 the RIA installed equipment/machinery for the manufacture of metal field gun carriages.
- Since 1892, RIA has maintained a mission for the manufacture of gun carriages and other weapons and weapons components.
- Completion of a multi-million dollar modernization project, Renovation of Armament Manufacturing (REARM) in 1991, has enhanced RIA's physical plant, machine tool inventory, and data processing capabilities.

#### **Mission:**

#### **Manufacturing:**

- RIA has expertise in the manufacture of weapons and weapon components.
- Core competencies at the RIA include artillery, gun mounts, recoil mechanisms, small arms, aircraft/naval parts and sub-systems, grenade launchers, weapons simulators, and other associated spare and repair parts.
- RIA's products include but are not limited to the M198 155mm Towed Howitzer, the M1 19 105mm Towed Howitzer, the MIAI Gun Mount used for the Army's main battle tank, and the M178/M182 series gun mount used for the M 109 Self Propelled Howitzer.

#### **Logistics:**

- The RIA logistics operation includes warehousing, care and preservation, transportation, and supply support.
- The assembly of equipment sets to form Basic Issue Items (BII) kits for self-propelled artillery, tanks, reconnaissance vehicles, and track vehicles is a major part of RIA's logistics activity.
- RIA is uniquely responsible for a number of major Army programs involved in the fabrication, assembly, and worldwide distribution of common tool sets and supplies used to repair and maintain a variety of systems, vehicles, and other support functions in the field.
- RIA currently has 7 funded projects in support of the War Reserve Program.

**Base Operations:**

- The RIA base operations include class I installation support for all tenants of Rock Island Arsenal.
- Functions include supply, purchasing, information management, personnel administration, communications and ADP services, building maintenance, and fire protection and security.
- Support is provided to the off-base organizations satisfying approximately 40 Inter-service Support Agreements.

**Location:**

- Rock Island Arsenal is located on an island in the upper Mississippi River between Iowa and Illinois.
- RIA is part of the metropolitan area known as the Quad Cities, comprised of Davenport and Bettendorf on the Iowa side of the river, and Moline and Rock Island on the Illinois side.

**Size:**

- RIA has a total of 946 acres, 400 acres of developed land and 250 acres that could be developed.
- The developed area accommodates 207 buildings and structures with a total of 6.5 million square feet of floor space.

**Transportation Access:**

- Rock Island Arsenal has direct access to interstate highways 80 and 74, direct daily air service from Quad City Airport to Chicago, St. Louis, Minneapolis, Denver, and Kansas City.
- The existing rail services and river barge transportation systems provide flexibility for movement of bulk commodities.

**Environmental Constraints:**

- Rock Island is constrained by the following environmental regulations:
  1. National Environmental Act (NEPA)
  2. Federal Facilities Compliance Act (FFCA)
  3. Solid Waste Disposal Act (SWDA)
  4. Clean Water Act (CWA)
  5. Clean Air Act (CAA) and Amendments (CAAA)
  6. Comprehensive Environmental Response, Compensation and Liability
  7. Superfund Amendments Reauthorization Act (SARA)
  8. Toxic Substance Control Act (TSCA)

9. Resource Conservation and Recovery Act RCRA)
10. Emergency Planning and Community Right-to-Know Act (EPCRA)
11. 40 Code of Federal Regulations 265 (40 CFR 265)
12. National Pollution Discharge Elimination System (SCAQMD)
13. Antiquities Act of 1956 (16 USC 432-43@)
14. Historic Sites Act of 1935 (16 USC 470)
15. National Historic Act of 1966
16. Executive Order 11593 - Protection & Enhancement of the Environment
17. Occupational Safety Act OSHA 1990
18. Hazardous Materials Transportation Act 1975
19. Oil Pollution Act 1990
20. EO 12088 - Federal Compliance with Pollution 1978
21. EO 12856 - Federal Compliance with Right-to-Know 1993
22. National Fire Code NFPA 30
23. Endangered Species Act 1993 (USC 153 1)
24. Sikes Act of 1960
25. Wild & Scenic River Act USC 127 1)
26. Fish & Wildlife Coordination Act (USC 666)
27. EO 11988 - Flood Plain Management 1997
28. Noise Control Act 1972 (USC 4901)
29. Water Quality Improvement Act 1974.

## **1.8.2 TECHNOLOGICAL ENHANCEMENTS**

### **Manufacturing/Repair Techniques/Processes:**

- During FY 98, RIA installed a CNC gear generator which replaced seven, 30 year old conventional gear hobs. The new gear generator allows for consistent manufacture of complex gear configurations, with a high degree of accuracy.
- Planned FY 99 Capital Investments include 7 equipment projects, 3 ADP projects, and 2 construction projects with a combined estimated value of \$3.5m.

### **Significant Existing/Current Capabilities**

#### **Manufacturing:**

- RIA is a Center of Technical Excellence (CTX) for weaponry and support equipment; recognized as the only U.S. source of hydro-pneumatic recoil mechanisms and towed artillery carriages.
- RIA is unique in the range of metal manufacturing capabilities, all of which are housed under a single roof. The integrated design allows for coherent flow of parts from foundry and forge shops, through welding and machining, to final finishing and assembly.

- RIA has the latest austempered ductile iron technology and the OSHA approved foundry is capable of casting both ferrous and non-ferrous metals (steel, armor plate, nodular iron, brass, and aluminum). Patterns can be produced in house utilizing Laminated Object Manufacturing (LOM).
- The plating shop can apply chrome, nickel, cadmium, and copper, and can galvanize parkerize, anodize and apply oxide finishes.
- RIA is a leader in direct numerical control machining processes including laser and 7 axis machining.
- RIA is an Army Flexible Computer Integrated Manufacturing (FCIM) facility and a member of the Western Illinois/Eastern Iowa Manufacturing Technology Consortium (MTC).
- RIA has the first Joint Engineering Data Management Information & Control System (JEDMICS) which is a DOD CALS compliant repository for storing and on-line access of engineering and technical data.
- Although RIA's mission is weapons production, each process/capability can satisfy any metal working requirement.

#### **Logistics:**

- The arsenal is the only DOD designated installation authorized to demilitarize small arms weapons and components.
- RIA logistics operation includes a modern Woodworking/Fabrication Shop, and a state-of-the-art Robotics Paint System that permits the application of Chemical Agent Resistant Coating (CARC).

#### **Science and Engineering:**

- RIA has a full time staff of professional engineers, chemists, metallurgist, physical scientist and technicians backed by state-of-the-art facilities.
- The primary emphasis is production assistance in the form of configuration management and material review.
- Secondary involvement includes research and development, component and assembly design, fabrication assistance, materials testing, failure analysis, and environmental test support.

#### **Quality Control:**

- RIA has a full time staff to conduct test, inspections, and technical support services to assure product and process control.
- For measuring large and complex parts, computerized Coordinate Measuring Machines (CMM) are used in conjunction with Data Mics providing comprehensive analysis capability for Statistical Process (SPC) applications.
- RIA has an extensive non-destructive testing (NDT) capability using X-Ray, magnetic particle, liquid penetrate, ultrasonic, and eddy current inspection methods. RIA is

- Certified under the IOC Contractor Performance Certification Program (CP2) and has received ISO 9002 registration.

### **1.8.3 COMMODITIES AND PRODUCTS**

#### **Ordnance**

Accessories and Components  
Conventional Arms & Explosives  
Guns & Artillery  
Small Arms

### **1.8.4 PROCESSES AND TECHNOLOGIES**

#### **Cleaning/Stripping**

Abrasive Flow  
Glass Media Blast  
Grit Blast  
Hazardous Chemicals  
Plastic Media Blast  
Sand Blast  
Steam  
Ultrasonic  
Vapor-Degreaser  
Vibratory Finishing

#### **Fabrication/Repair**

Cutting Plasma  
Electrical Discharge Machining (EDM)  
Eprom/Prom Programming  
Flexible Machining Cell  
Forging - 16,000LB Drop Hammer  
Forging - Aluminum  
Forging - Diesinking  
Forging - High Alloy Steel  
Forging - Impression Die, Open Die  
Forging - Mechanical Upset  
Foundry - Aluminum  
Foundry - Armor Steel Castings  
Foundry - Austempered Ductile Iron

#### **Fabrication/Repair**

7 Axis Machining Center  
CAD/CAM - CNC & NC Programming  
CAD/CAM - Drilling/Lathe/Punch  
CAD/CAM - Engineering Analysis  
CAD/CAM - Engineering Design/Drawings  
CAD/CAM - Forming/Machining/Milling  
CAD/CAM - Vertical Internal Grinder  
CAD/CAM - Sheetmetal  
Chemical Forming/Machining/Milling  
Class I 00,000 Clean Room  
CNC Forming/Machining/Milling  
Cutting - Oxyfuel

#### **Fabrication/Repair**

Plating - Anodizing  
Plating - Black Oxide  
Plating - Cadmium  
Plating - Chromate  
Plating - Chromium  
Plating - Copper  
Plating - Lead  
Plating - Manganese Phosphate  
Plating - Nickel  
Plating - Zinc Phosphate  
Robotic Auto Cleaning System  
Robotic CARC Painting  
Robotic Metal Spray

**Fabrication/Repair**

Foundry - Ferrous  
Foundry - High Alloy Steel Castings  
Foundry - Laminated Object Manufacturing  
Foundry - Non-ferrous  
Foundry - Pattern Making  
Foundry - Stainless Steel  
Gage Manufacture Functional  
Gage Manufacture  
-Small Arms Gage Manufacture  
-Field and Laboratory  
Gear Cutting - Bevel Gear Manufacturing  
Gear Cutting - Hobbing  
Gear Cutting - Shaping  
Heat Treating  
Heat Treating - Annealing  
Heat Treating - Carbon Restoration  
Heat Treating - Carburizing  
Heat Treating - Gas Nitration  
Heat Treating - Hardening  
Heat Treating - Tempering  
Investment Casting  
Investment Casting Aluminum  
Investment Casting Armor Steel  
Investment Casting High Alloy Steel  
Investment Casting Stainless Steel  
Laser Punch  
Metal Finishing  
Metrological  
Optics  
Phosandodize  
Plastic Injection

**Test and Inspection**

Chemical Analysis - Hazardous Waste  
Chemical Analysis - Oil Analysis  
Chemical Analysis - Organic Materials  
Chemical Analysis - Product Check  
Chemical Analysis - RCRA Metals TCLP  
Chemical Analysis - Water Identification  
Coordinate Measuring  
Eddy Current

**Fabrication/Repair**

Robotic Metalizing  
Robotic Painting  
Robotic Welding  
Rubber Products  
Spring Manufacture - Belleville  
Spring Manufacture - Compression  
Spring Manufacture Extension  
Spring Manufacture Flat  
Spring Manufacture Involute  
Test Program Sets  
Tool and Die  
Water Jet  
Welding - Arc  
Welding - Certified Ballistic  
Welding - Dabber TIG  
Welding - Electron Beam  
Welding - Flexible Welding System  
Welding - Inertia  
Welding - Laser  
Welding - Orbital Welding  
Welding Plasma  
Welding Submerged Arc  
Welding TIG, MIG

**Test and Inspection**

Calibration  
Chemical Analysis - Alloy Identification  
Chemical Analysis - Coating Identification  
Mechanical/Metallurgical  
- Case Depth  
- Failure Analysis  
- Hardness  
- Impact/Toughness  
- Properties Fatigue Testing  
- Tensile/Compression  
- Nondestructive Testing  
- Level III Procedure Approval  
- Level III Technicians  
- Liquid Penetrant Test  
Radiography - Gamma  
- Flow Proportional Counting



**Test and Inspection**

Electron Microscope  
Electronic ATE - Analog  
Electronic ATE - Digital  
Electronic ATE - Ditmco - Ultrasonic Testing  
Electronic ATE GenRad  
Environmental Chamber  
Fiber Optics  
Fluorescent Penetrant Automated  
Fluorescent Penetrant Manual  
Gymnasticator  
Hydraulic Systems  
Instrumentation Capabilities

- Optical Emission Spectrometer
- Atomic Absorption Spectrometer
- Carbon/Sulfur Analysis
- Fourier Transform Infrared
- Gas Analyzers
- Hose Burst Testers
- Humidity Chambers
- Ion Chromatograph
- Liquid Scintillation Counters
- Metal Graphs
- Ozone Chamber
- Pour Point Apparatus
- Salt Spray Cabinet
- UN-Visible Spectrometer
- Viscosimeters
- Wear Testers
- Weld Bend Tester

**Test and Inspection**

- Health Physics  
- Liquid Scintillation  
- Sealed Source Leak Testing  
-Swipe Testing, Alpha, Beta  
Spectrographic Analysis  
Stress  
Test & Measurement Equipment Calibration  
Test Slope  
Test Tank  
Test Track  
Type II Laboratory  
Ultrasonic - Automated  
Ultrasonic - Manual  
Vibration Testing  
Video Inspection Probe  
Weapons Testing Horizontal Simulators  
X-Ray - Film  
X-Ray - Real Time



## **1.9 Watervliet Arsenal (WVA), Watervliet, New York**

### **1.9.1 OVERVIEW**

#### **History:**

- Established in 1813 in the City of Watervliet, New York.
- Original mission was as a producer of smaller pieces of equipment for artillery trains.
- In 1883, the Army as the United States' national gun factory selected WVA.
- In 1902, the first 16-inch breech loaded gun was produced.
- Major equipment modernization and installation computerization in the 1980's and 1990's.

#### **Mission:**

The mission of Watervliet Arsenal is to perform manufacturing, engineering, fabrication, procurement and product assurance for assigned materials. Current material assignments include:

- Cannon for tanks
- Towed and self-propelled Mortars
- Recoilless rifles
- artillery and associated components

While the arsenal is recognized as a manufacturer of cannons and battleship guns, a wide variety of other products, such as mortars, marine drives, tow bars, bomb racks, and rocket motors are also produced. The arsenal fabricates prototype and an advanced engineering model, major and secondary items, and repair parts. The arsenal also provides administrative and logistical support services to tenants.

Principal End Items include 120MM M256 cannon, 155MM M284 howitzer, 155MM M284 Paladin kit, 155MM M284 Reserve Component Armaments System (RCMAS) kit, 155MM M198 Product Improvement Program (PIP) kit, 60MM M224 Mortar, Tow Bar, Gun Mount Ballistic Shield, as well as secondary spares and research and engineering items.

#### **Location:**

- Watervliet Arsenal is located in update New York within the city of Watervliet, six miles from the state capital of Albany.
- Watervliet is in the Albany-Schenectady-Troy Metropolitan Statistical Area (MSA), Albany County.
- Surrounding counties include Green, Montgomery, Renssalaer, Saratoga and Schenectady.

**Size:**

- WVA is located on 140 acres of land.
- 3.3 miles of road and 2.9 miles of railroad.
- Comprised of 72 buildings with 2.1M square feet of floor space.
- Facility value is \$384M.
- Equipment value is \$694M.

**Workforce/Payroll:** WVA would prefer not to respond to this section due to the pending CA review.

**Transportation Access:** Watervliet Arsenal is located along the Hudson River, ten miles from the port of Albany. The Delaware & Hudson Railroad runs along the western boundary of the installation, providing an excellent means of transporting heavy material. The installation is located only two miles from the interstate highway system and seven miles from the Albany Airport.

**Environmental Constraints:** The following is a list of environmental regulations that affect Watervliet Arsenal:

1. 40 CFR, Subchapter C, Parts 50-99 (Air Programs)
2. 40 CFR, Subchapter D, Parts 100-149 (Water Programs)
3. 40 CFR, Subchapter E, Parts 150-189 (Pesticide Programs)
4. 40 CFR, Subchapter F, Parts 190-195 (Radiation Protection Program)
5. 40 CFR, Subchapter G, Parts 201-211 (Noise Abatement Program)
6. 40 CFR, Subchapter I, Parts 240-299 (RCRA - Solid Waste)
7. 40 CFR, Subchapter J, Parts 300-399 (Superfund, Emergency Planning, and Community Right to Know Program)
8. 40 CFR, Subchapter N, Parts 400-471 (Effluent Guidelines and Standards)
9. 40 CFR, Subchapter R, Parts 700-799 (Toxic Substance Control Act)
10. 40 CFR, Subchapter A, Parts 106-110 (Hazardous Materials Transportation, Oil Transportation, and Pipeline Safety)
11. 6NYCRR, Chapter III, Subchapter A, Parts 200-250 (Prevention and control of Air Contamination and Air Pollution)
12. 6NYCRR, Chapter III, Subchapter B, Parts 255-257 (Air Quality Classification and Standards.
13. 6NYCRR, Chapter III, Subchapter C, Parts 260-312 (Air Quality Area Classification)
14. 6NYCRR, Chapter IV, Subchapter A, Part 320 (Pesticide Control)
15. 6NYCRR, Chapter IV, Subchapter B, Part 360 (Solid Waste)
16. 6NTCRR, Chapter IV, Subchapter E, Part 450 (Noise)
17. 6NYCRR, Chapter IV, Subchapter G, Part 480 (Program Fees)
18. 6NYCRR, Chapter V, Subchapter D, Part 600 (Water Regulations)
19. 6NYCRR, Chapter X, Subchapter A, Part 750 (Pollutant Discharge Elimination System)

20. AR 200-1 (Environmental Protection and Enhancement)
21. AR 200-2 (Environmental Effects of Army Actions)
22. AR 200-3 (Natural Resources - Land Forest and Wildlife Management)

### **Manufacturing Enhancements**

- Replace and upgrade the existing Distributed Numerical Control (DNC) system with a client server based system.
- Replace and upgrade the existing Rotary Forge Data Collection system.
- Implement laser scanner technology for reverse engineering capability in support for rapid prototyping of small parts.
- Migrate the Computer Aided Process Planning (CAPP) software to an Open Database Compliant (ODBC) package.
- Upgrade the existing boroscope inspection equipment to a portable color boroscope capable of making a permanent videotape record of the bore of any cannon.
- Implementation of an improved Gun Tube Inspection Station to ensure tighter tolerances of bore straightness and profile.
- Received American Bureau of Shipping certification
- Developed ability to do fiberglass wrap on ship propulsion shafts
- Ability to manufacture aluminum airframe components

## **1.9.2 COMMODITIES AND PRODUCTS**

### **General Support Equipment**

Accessories and Components

### **Ordnance**

Accessories and Components

Guns & Artillery

## **1.9.3 PROCESSES AND TECHNOLOGIES**

### **Cleaning/Stripping**

Agricultural Media Blast

Glass Media Blast

Grit Blast

Hazardous Chemicals

Sand Blast

Vibratory Finishing

### **Fabrication/Repair**

CAD/CAM - CNC & NC Programming

CAD/CAM - Drilling/Lathe/Punch

CAD/CAM - Engineering Analysis

CAD/CAM - Engineering Analysis

CAD/CAM - Engineering Design/Drawings

CAD/CAM - Forming/Machining/Milling

CAD/CAM - Sheetmetal

CAD/CAM - Vertical Internal Grinder

CARC Painting

Ceramics

CNC Forming/Machining/Milling

Cutting - Oxyfuel

### **Fabrication/Repair**

Cutting - Plasma

Cutting - Water Jet

Electrical Discharge Machining

Extrude Honing

Flame Spray

Flexible Machining Cell

Heat Treating

Laser Marking Parts

Metal Finishing

Plating - Anodizing

Plating - Chrome

Plating - Tin/Lead

## **Fabrication/Repair**

Rotary Forging  
Titanium Nitride Coating  
Tool and Die  
Welding - Arc  
Welding - Plasma  
Welding - TIG, MIG

## **Test and Inspection**

Air/Fuel Flow  
Calibration  
Electron Microscope  
Fluorescent Penetrant - Manual  
Hydraulic Systems  
Magnetic Particle  
Radiography - X-Ray  
Stress  
Ultrasonic - Manual  
Video Inspection Probe  
X-Ray – Film

